



Via Email & FedEx

April 29, 2011

Joseph LeMay, Remedial Project Manager
US EPA, Office of Site Remediation and Restoration
5 Post Office Square, Suite 100
Boston, MA 02109-3912

RE: Indoor Air Quality and Vapor Intrusion Assessment: Report of Results
Residence, Woburn, MA, 26/ 05/ 04
Wells G&H Superfund Site, Woburn, Massachusetts

Dear Joe,

On behalf of UniFirst Corporation, ARCADIS, U.S., Inc. has prepared the attached report, *Indoor Air Quality and Vapor Intrusion Assessment: Report of Results, Residence, Woburn, MA, 26/ 05/ 04*, which describes the first round of sampling undertaken in accordance with ARCADIS' *Vapor Intrusion Assessment Work Plan* approved by the U.S. Environmental Protection Agency on February 17, 2011. We would expect this report would be provided to the property owner by the end of next week.

Should you have any questions regarding the enclosed document, please call.

Sincerely,

A handwritten signature in blue ink, appearing to read 'T Cosgrave', is written over a faint, light blue circular background.

Timothy Cosgrave
UniFirst Project Coordinator

cc: Cindy Lewis, US EPA
Joe Coyne, MassDEP
Dave Sullivan, TRC
Jack Badey, UniFirst
Greg Bibler, GP

Indoor Air Quality and Vapor Intrusion Assessment: Report of Results

**Residence, Parcel 26/ 05/ 04
Wells G&H Superfund Site
Woburn, Massachusetts**

April 2011

Submitted to:

United States Environmental Protection Agency Region 1
5 Post Office Square, Suite 100
Boston, Massachusetts 02109-3912

Prepared for:

UniFirst Corporation
68 Jonspin Road
Wilmington, Massachusetts 01887



A handwritten signature in black ink that reads "Nadine Weinberg".

Nadine Weinberg
Principal Scientist/Project Manager

A handwritten signature in black ink that reads "Brian Magee".

Brian Magee, PhD
Vice President and Principal Toxicologist
Human Health Risk Assessment Technical Leader

**Indoor Air Quality and Vapor
Intrusion Assessment:
Report of Results**

Residence, Parcel 26/ 05/ 04
Wells G&H Superfund Site
Woburn, Massachusetts

Prepared by:
ARCADIS U.S., Inc.
2 Executive Drive
Suite 303
Chelmsford
Massachusetts 01824
Tel 978 937 9999
Fax 978 937 7555

Our Ref.:
MA000989.0002

Date:
April 2011

*This document is intended only for the use
of the individual or entity for which it was
prepared and may contain information that
is privileged, confidential and exempt from
disclosure under applicable law. Any
dissemination, distribution or copying of
this document is strictly prohibited.*

1. Introduction	1
2. Sampling Program	1
2.1 Pre-Sampling Activities	2
2.2 Installation of Sub-Slab Soil Vapor Points	2
2.3 Indoor Ambient Air Assessment	3
2.4 Outdoor Ambient Air Assessment	3
2.5 Sub-Slab Soil Vapor Assessment	4
2.6 Data Synthesis and Reporting	4
3. Results and Discussion	5
3.1 Indoor and Outdoor Ambient Air Sampling Results	5
3.2 Sub-Slab Soil Vapor Sampling Results	5
3.3 Evaluation of Indoor Air and Sub-slab Soil Vapor Results	6
3.4 Residence Human Health Risk Evaluation	7
4. Summary and Conclusions	7
5. Recommendations	8
6. References	8

Tables

Table 1	Indoor and Ambient Air Sampling Results – Residence
Table 2	Sub-Slab Soil Vapor Sampling Results – Residence

Figures

Figure 1	Residence Sample Locations – March 2011
----------	---

Appendices

A	Sampling Logs
B	Building Survey and Product Inventory Field Form

C	Data Validation Report
D	Laboratory Analytical Data Package
E	Preliminary Human Health Risk Evaluation Report

1. Introduction

On behalf of UniFirst Corporation (UniFirst), ARCADIS has prepared this Indoor Air Quality and Vapor Intrusion Assessment: Report of Results for sampling conducted on March 11-12, 2011 at the residential property in Woburn, Massachusetts, identified in the tax assessors' records as Woburn Parcel Number 26/ 05/ 04 (the Residence). ARCADIS conducted sub-slab soil vapor, indoor ambient air, and outdoor ambient air sampling. All work was completed in accordance with the *Vapor Intrusion Assessment Work Plan (Work Plan)* approved by the U.S. Environmental Protection Agency (USEPA) on February 17, 2011 (ARCADIS 2011).

As stated in the *Work Plan*, USEPA requested the collection of sub-slab soil gas, indoor air, and ambient air samples from certain residential and commercial properties located on Olympia Avenue, Oregon Avenue, and Marietta Street (Study Area). The Residence is one of the properties that USEPA identified for study. The *Work Plan* was submitted to and approved by USEPA to establish the sampling methods and procedures to be followed. The objectives of the sampling were to:

- Measure concentrations of volatile organic compounds (VOCs) in sub-slab soil vapor and indoor air at each property identified for study by USEPA in the Study Area; and
- Measure concentrations of VOCs in outdoor air near these properties to evaluate atmospheric conditions at the time of indoor air sample collection.

The results of the vapor intrusion sampling, sampling methodology, a discussion of the sampling results including a preliminary human health risk evaluation, and recommendations for future actions are provided below.

2. Sampling Program

Consistent with the *Work Plan*, ARCADIS collected sub-slab soil vapor, indoor air, and ambient air samples from the Residence on March 11-12, 2011. Specific sampling methodologies were consistent with the *Indoor Air Quality and Vapor Intrusion Assessment Scope of Work – Revision 2 (SOW)* (JCO 2010a) and the *Quality Assurance Project Plan – Revision 1 (QAPP)* (JCO 2010b). Pre-sampling activities, sampling methodologies, and sample locations are described below. Sample logs are provided in Appendix A.

2.1 Pre-Sampling Activities

Prior to sampling, ARCADIS, in coordination with the USEPA, was granted access to the Residence from the current property owner. Sample locations were agreed upon between the USEPA, ARCADIS, and the current property owner. ARCADIS conducted a site reconnaissance prior to sampling to identify the building and foundation condition, building materials, heating, ventilation, and air conditioning (HVAC) operation, and potential preferential vapor migration pathways (i.e., sump pump, floor drains, cracks). A product inventory was completed to list items observed in the building that may contain VOCs that could potentially interfere with sample results.

During the building survey the following potential background sources were identified:

- Field staff noted a car in the garage and a small fuel leak in the fuel oil line in the basement of the home. These are likely sources of concentrations of the petroleum constituents benzene, ethylbenzene, toluene, xylenes (BTEX), naphthalene, and 1,2,4-trimethylbenzene subsequently detected in indoor air.
- The home owner was seen smoking a cigarette in the basement of the home during indoor air sampling which may be a source of benzene, toluene, 1,3-butadiene, and naphthalene (<http://www.epa.gov/ttnatw01/hlthef/>).
- Bottles of bleach were noted in the basement during the site visit which may be sources of chloroform via reactions with other cleaning products (Odabasi 2008).

Since indoor air sampling was conducted only in the basement, the survey was not extended to the first floor or garage, but additional background sources of some chemicals were observed in those areas. As feasible, products were containerized and removed from the basement of the home prior to sampling. The building survey and product inventory can be found in Appendix B.

2.2 Installation of Sub-Slab Soil Vapor Points

One permanent sub-slab soil vapor sample point was installed in the basement of the Residence on March 5, 2011. The other sub-slab soil vapor sample point was a temporary point and was installed immediately prior to sampling on March 11, 2011. A temporary point was used due to the thin (1-inch) concrete encountered in one section of the basement. Sample locations can be seen in Figure 1.

Sample methods were consistent with those described in the *SOW* (JCO 2010a) and *QAPP* (JCO 2010b). The permanent sample point was constructed of decontaminated stainless steel fittings assembled prior to the field event. The permanent sample point was cemented into the drilled holes using hydraulic cement. The permanent sample point was allowed to sit and equilibrate for at least 24 hours after installation prior to sampling. Detailed methods for permanent sample point installation are included in SOP-JCO-062 contained in the *QAPP* (JCO 2010b). The temporary sample point was installed as described in the *Work Plan* (Arcadis 2011). During sampling, the temporary sample point was sealed with clay and Teflon tape to prevent indoor air from entering into the sample point. The temporary sample point was filled with hydraulic cement after sampling. Consistent with the *SOW* (JCO 2010a) and *QAPP* (JCO 2010b), a helium tracer test was completed prior to sampling each sub-slab soil vapor point to test the integrity of the probe installation.

2.3 Indoor Ambient Air Assessment

On March 11, 2011, indoor air sampling was initiated at two locations on the basement level of the Residence. All indoor air samples were co-located with the installed sub-slab soil vapor points. Sample locations are presented in Figure 1. Sample methods were consistent with the *SOW* (JCO 2010a) and *QAPP* (JCO 2010b). Samples were collected from the breathing zone (3 to 4 feet above ground surface) above each sub-slab soil vapor location. To avoid any cross contamination issues with potential vapors under the floor slab, indoor air samples were collected prior to sub-slab soil vapor samples. To ensure a reasonable worst case scenario, indoor air sampling was conducted with all exterior building doors closed to avoid any dilution with outside air.

Samples were collected over a 24-hour period in individually certified six-liter passivated sample canisters provided by Alpha Analytical, Inc. of Mansfield, Massachusetts (Alpha), a National Environmental Laboratory Accreditation Conference (NELAC) (E87814) certified laboratory. Canisters were analyzed for VOCs by USEPA Method TO-15 featuring selective ion monitoring (SIM). Detailed sample collection methods are included in the *SOW* (JCO 2010a) and in SOP-JCO-063 contained in the *QAPP* (JCO 2010b). Sample logs from indoor air sampling are included in Appendix A.

2.4 Outdoor Ambient Air Assessment

On March 11, 2011, outdoor air sampling was initiated at one upwind location outside the Residence using the same methods as described for indoor air samples. The sample was collected to understand what contribution the ambient environment may

have on indoor air samples collected from inside the building. Sample locations are presented in Figure 1. The outdoor ambient air and indoor air samples were collected over approximately the same 24-hour time period, with the outdoor sample being started immediately prior to the indoor air samples. Sample logs from ambient air sampling are included in Appendix A.

2.5 Sub-Slab Soil Vapor Assessment

At the completion of the indoor air sampling on March 12, 2011, sub-slab soil vapor samples were collected from two sample locations in the Residence. Prior to sampling, three volumes of the sample tubing were purged utilizing a low-flow pump to remove any ambient air from the sampling train. Detailed methods for sampling are included in SOP-JCO-062 contained in the *QAPP* (JCO 2010b) and in the *Work Plan* (ARCADIS 2011). Samples were collected over a 30-minute period in individually certified six-liter passivated sample canisters provided by Alpha. Canisters were analyzed for VOCs by USEPA Method TO-15 featuring SIM. Sample logs from sub-slab soil vapor sampling are included in Appendix A.

2.6 Data Synthesis and Reporting

Analytical data packages generated by the laboratory were validated by Phoenix Chemistry Services according to national guidelines for tier III data validation as described in the *SOW* (JCO 2010a) and *QAPP* (JCO 2010b). The data review included: field documentation, proper holding times, proper chain-of-custody documentation, achievement of target reporting limits, acceptable laboratory calibrations and quality control parameters, and representativeness of duplicate results.

Findings of the validation effort resulted in the following qualifications of sample results:

- Results for naphthalene in all samples analyzed by Method TO-15 SIM were qualified as estimated (J, UJ).
- Result for tetrachloroethene in sample SS-1 was rejected (R) and replaced with the acceptable concentration from the more diluted analysis of this sample.

Quality control results, including any revisions or qualifiers deemed necessary, are included in Tables 1 and 2. The data validation report is included in Appendix C. The laboratory analytical data package is included in Appendix D.

3. Results and Discussion

This section presents results for indoor air, ambient outdoor air, and sub-slab soil vapor samples collected at the Residence, including a summary evaluation of potential human health risks. A copy of the complete Preliminary Human Health Risk Evaluation can be found in Appendix E.

3.1 Indoor and Outdoor Ambient Air Sampling Results

Analytical data for indoor and outdoor ambient air samples are presented on Table 1. The following compounds were detected in both indoor air samples: 1,2,4-trimethylbenzene, 1,3-butadiene, benzene, carbon tetrachloride, chloroform, ethylbenzene, naphthalene, tetrachloroethene (PCE), toluene, and xylenes. Methylene chloride was detected in location IA-2, but was not detected at location IA-1. Detected concentrations of these constituents are presented in Table 1.

The following constituents were detected in the outdoor ambient air sample: 1,3-butadiene, benzene, carbon tetrachloride, and toluene. Detected concentrations of these constituents are presented in Table 1.

A comparison of the data indicates that several constituents were detected in both outdoor and indoor air. Carbon tetrachloride was measured at similar concentrations in indoor and outdoor air. Although 1,3-butadiene, benzene, and toluene were detected in both outdoor and indoor air, concentrations were greater in indoor air compared to outdoor ambient air.

3.2 Sub-Slab Soil Vapor Sampling Results

Analytical data for sub-slab soil vapor are presented in Table 2. The following compounds were detected in both sub-slab soil vapor samples: 1,1,1-trichloroethane, carbon tetrachloride, PCE, and xylenes. Several constituents were only detected in one sub-slab soil vapor sample. 1,2,4-Trimethylbenzene, 1,3-butadiene, benzene, chloroform, ethylbenzene, and toluene were detected only in SS-2; naphthalene was detected only in sample SS-1. Detected concentrations of these constituents are presented in Table 2.

3.3 Evaluation of Indoor Air and Sub-slab Soil Vapor Results

The data results for indoor air and sub-slab soil vapor were evaluated together to determine if indoor air samples were associated with a potential background source. As a first step, attenuation factors (AFs) were calculated to evaluate if chemicals present in indoor air could potentially be associated with sub-slab soil vapor levels, or if chemicals may be attributable to background sources. The AF is the ratio of indoor air to sub-slab soil vapor results and was calculated when a constituent was detected in both indoor air and sub-slab soil vapor. AFs close to or greater than one indicate that indoor air concentrations are equal to or higher than sub-slab soil vapor concentrations and, therefore, that a background source likely is present. Of the 11 chemicals detected in indoor air, the following nine chemicals had AFs greater than or very close to one: 1,2,4-trimethylbenzene, 1,3-butadiene, benzene, carbon tetrachloride, chloroform, ethylbenzene, naphthalene, toluene, and xylenes. As a result, the presence of these chemicals in indoor air is attributable to background sources and not soil vapor intrusion.

Second, the data were evaluated to identify constituents that were detected only in indoor air. These results indicate a background material is the only source of the detected indoor air concentrations. Methylene chloride was identified as having background sources based on this criterion.

Third, the results of indoor air and outdoor air samples were compared. Carbon tetrachloride was measured at a similar concentration in outdoor ambient air. These results indicate background sources are present in outdoor ambient air. Although 1,3-butadiene, benzene, and toluene were detected in both outdoor and indoor air, concentrations were greater in indoor air compared to outdoor ambient air. These results, however, are consistent with the observation of a leaking fuel oil line in the basement.

PCE was detected in indoor air at a lower concentration compared to the co-located sub-slab soil vapor samples. Sub-slab soil vapor therefore may be a contributing source of PCE detections in indoor air. The low concentrations of PCE detected, however, are consistent with those typically measured in residences, as reported by USEPA and the Massachusetts Department of Environmental Protection (MADEP). PCE was detected in indoor air samples in the Residence at concentrations between 0.5 and 0.6 $\mu\text{g}/\text{m}^3$. For PCE, USEPA's indoor air background database reported a 50th percentile value of 0.7 $\mu\text{g}/\text{m}^3$, a 75th percentile value of 1.4 $\mu\text{g}/\text{m}^3$, and a 90th percentile

value of $3.8 \mu\text{g}/\text{m}^3$ (Dawson 2008). The PCE concentrations measured in the Residence also are below the MADEP Threshold Value (TV) for PCE of $1.4 \mu\text{g}/\text{m}^3$.

According to MADEP, when compounds of concern are measured in indoor air at levels that are below TVs, it can reasonably be concluded that a complete vapor intrusion pathway does not exist. Therefore, vapor intrusion does not pose a risk in that building.

3.4 Residence Human Health Risk Evaluation

Preliminary human health risk calculations were performed using the March 2011 validated indoor air data. The Preliminary Human Health Risk Evaluation Report and supporting calculations can be found in Appendix E. The conclusions from that report are summarized below.

Potential risks from indoor air were calculated assuming a homebound individual lives in the Residence for 30 years, 24 hours per day, and 350 days per year. For each constituent, the exposure point concentration in indoor air is equal to the average concentration of the two indoor air results. The estimated total cancer risk associated with long term exposure to indoor air in the basement of the home is 4×10^{-5} , primarily associated with benzene and naphthalene. Only 3% of the total risk (1×10^{-6}) is associated with PCE. The majority of risk (97%) is associated with background sources. 1,3-Butadiene, benzene, chloroform, ethylbenzene, and naphthalene were all detected at higher concentrations in indoor air than sub-slab soil vapor. Carbon tetrachloride was detected at a similar concentration in ambient air compared to indoor air. 1,3-Butadiene, benzene, and toluene were also detected in ambient air, so ambient air may have contributed to background concentrations. Methylene chloride was not detected in sub-slab soil vapor or ambient air, indicating a source inside the home.

As previously discussed many background sources of VOCs were noted in the basement of the home. These included a small fuel oil leak, a resident smoking a cigarette during sampling, and cleaning products.

4. Summary and Conclusions

The potential carcinogenic risk level estimated for the low levels of PCE detected in the Residence is 1×10^{-6} , a level of risk that is at the most conservative end of USEPA's risk range for Superfund sites. The estimated total risk, including exposure to other compounds in the Residence originating from background sources, is 4×10^{-5} , primarily

due to benzene and naphthalene. The low concentrations of PCE detected in the basement of the Residence are consistent with those typically measured in residences, as reported by USEPA and MADEP. Measured concentrations are below MADEP TV for PCE ($1.4 \mu\text{g}/\text{m}^3$). According to MADEP, when compounds of concern are measured in indoor air at levels that are below TVs, it can reasonably be concluded that a complete vapor intrusion pathway does not exist.

5. Recommendations

In accordance with the approved *Vapor Intrusion Assessment Work Plan: Off-Site Sub-slab and Indoor Air Evaluation* (ARCADIS 2011), another round of sampling will be conducted under warm weather conditions for comparison to the first round of results.

6. References

- ARCADIS, 2011. Vapor Intrusion Assessment Work Plan: Off-Site Sub-slab and Indoor Air Evaluation, Wells G&H Superfund Site, Woburn, Massachusetts, January 7.
- Dawson, Helen. 2008. Background Indoor Air Concentrations of Volatile Organic Compounds in North American Residences. Literature Review & Implications for Vapor Intrusion Assessment. Vapor Intrusion Workshop – AEHS Spring 2008, San Diego, California.
- Massachusetts Department of Environmental Protection (MADEP). 2008. Massachusetts Contingency Plan, 310 CMR 40.0000. Bureau of Waste Site Cleanup. February.
- Odabasi, M., 2008. Halogenated Volatile Organic Compounds from the Use of Chlorine-Bleach-Containing Household Products. *Environ. Sci. Technol.* 42:1445-1451.
- The Johnson Company (JCO). 2010a. Indoor Air Quality and Vapor Intrusion Assessment Scope of Work, Revision 2, UniFirst Property, Wells G&H Superfund Property. March 25.

JCO. 2010a, Quality Assurance Project Plan, Revision 1, Indoor Air Quality and Vapor Intrusion Assessment, UniFirst Property, Wells G&H Superfund Property. March 25.

Table 1. Indoor and Ambient Air Sampling Results - Residence

Sample Name: Date Collected:	Units	AA-1 03/11/11	IA-1 03/11/11	IA-2 03/11/11
Volatile Organics				
1,1,1-Trichloroethane	µg/m ³	0.109 U	0.109 U	0.109 U
1,1,2-Trichloroethane	µg/m ³	0.109 U	0.109 U	0.109 U
1,1-Dichloroethane	µg/m ³	0.0810 U	0.0810 U	0.0810 U
1,1-Dichloroethene	µg/m ³	0.0790 U	0.0790 U	0.0790 U
1,2,4-Trimethylbenzene	µg/m ³	0.0980 U	3.88	3.32
1,2-Dibromoethane	µg/m ³	0.154 U	0.154 U	0.154 U
1,2-Dichloroethane	µg/m ³	0.0810 U	0.0810 U	0.0810 U
1,2-Dichloropropane	µg/m ³	0.0920 U	0.0920 U	0.0920 U
1,3-Butadiene	µg/m ³	0.0440	0.351	0.292
1,3-Dichlorobenzene	µg/m ³	0.120 U	0.120 U	0.120 U
1,4-Dichlorobenzene	µg/m ³	0.120 U	0.120 U	0.120 U
Benzene	µg/m ³	0.405	5.93	5.31
Bromodichloromethane	µg/m ³	0.134 U	0.134 U	0.134 U
Bromoform	µg/m ³	0.206 U	0.206 U	0.206 U
Carbon Tetrachloride	µg/m ³	0.591	0.534	0.490
Chlorobenzene	µg/m ³	0.0920 U	0.0920 U	0.0920 U
Chloroform	µg/m ³	0.0980 U	0.507	0.346
cis-1,2-Dichloroethene	µg/m ³	0.0790 U	0.0790 U	0.0790 U
Ethylbenzene	µg/m ³	0.0870 U	2.50	2.40
Isopropylbenzene	µg/m ³	2.46 U	2.46 U	2.46 U
Methyl tert-butyl ether	µg/m ³	0.0720 U	0.0720 U	0.0720 U
Methylene Chloride	µg/m ³	1.74 U	1.74 U	2.50
Naphthalene	µg/m ³	0.262 UJ	0.890 J	0.498 J
Tetrachloroethene	µg/m ³	0.136 U	0.542	0.603
Toluene	µg/m ³	0.618	24.8	22.4
trans-1,2-Dichloroethene	µg/m ³	0.0790 U	0.0790 U	0.0790 U
trans-1,3-Dichloropropene	µg/m ³	0.0910 U	0.0910 U	0.0910 U
Trichloroethene	µg/m ³	0.107 U	0.107 U	0.107 U
Vinyl Chloride	µg/m ³	0.0510 U	0.0510 U	0.0510 U
Xylenes (total)	µg/m ³	0.260 U	14.4	13.4

Notes:

U - Constituent not detected

J - Indicates an estimated value

µg/m³ - micrograms per cubic meter

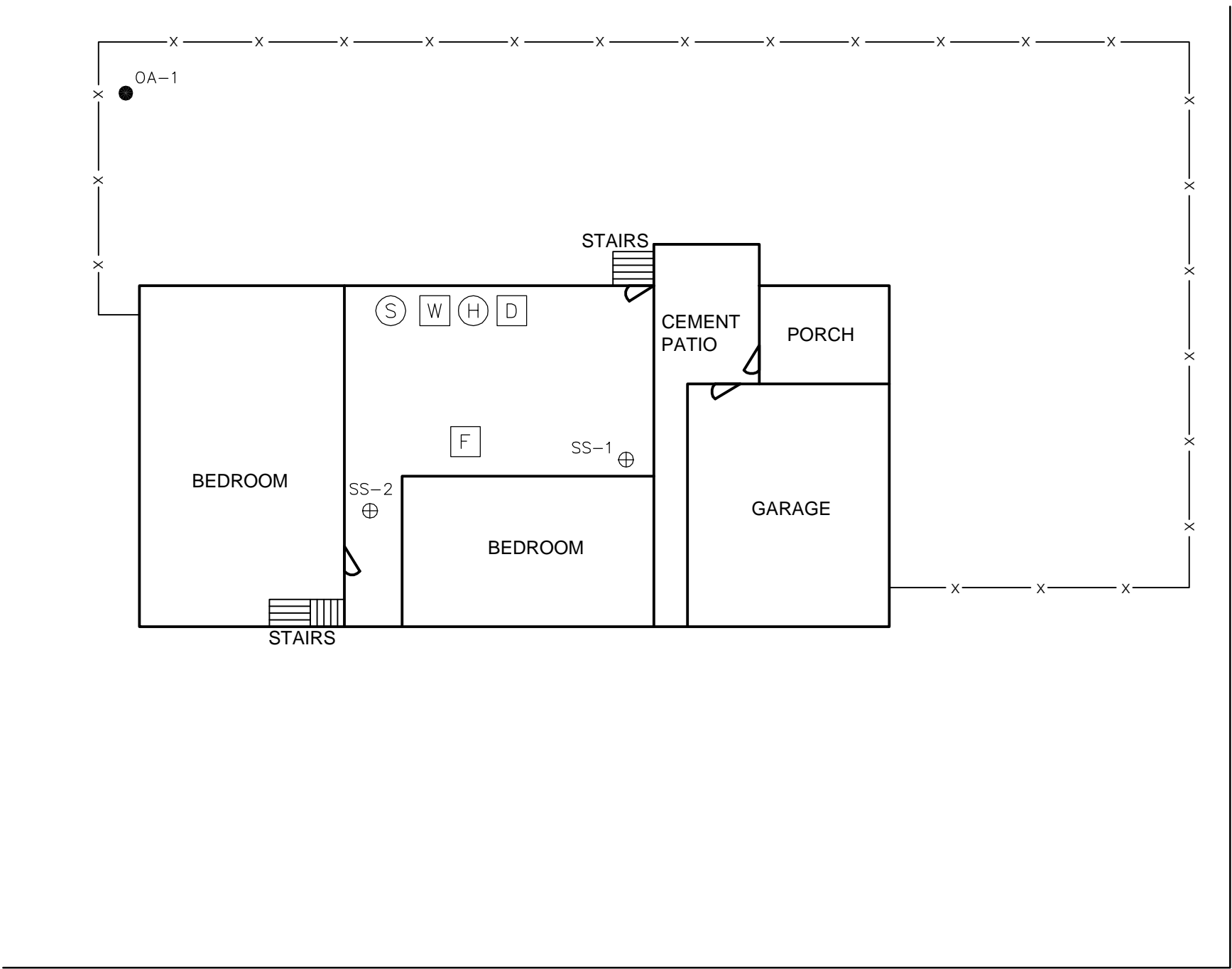
Table 2. Sub-Slab Soil Vapor Sampling Results - Residence

Sample Name: Date Collected:	Units	SS-1 03/11/11	SS-2 03/11/11
Volatile Organics			
1,1,1-Trichloroethane	µg/m ³	0.801	0.491
1,1,2-Trichloroethane	µg/m ³	0.109 U	0.109 U
1,1-Dichloroethane	µg/m ³	0.0810 U	0.0810 U
1,1-Dichloroethene	µg/m ³	0.0790 U	0.0790 U
1,2,4-Trimethylbenzene	µg/m ³	0.0980 U	0.319
1,2-Dibromoethane	µg/m ³	0.154 U	0.154 U
1,2-Dichloroethane	µg/m ³	0.0810 U	0.0810 U
1,2-Dichloropropane	µg/m ³	0.0920 U	0.0920 U
1,3-Butadiene	µg/m ³	0.0440 U	0.0690
1,3-Dichlorobenzene	µg/m ³	0.120 U	0.120 U
1,4-Dichlorobenzene	µg/m ³	0.120 U	0.120 U
Benzene	µg/m ³	0.223 U	1.34
Bromodichloromethane	µg/m ³	0.134 U	0.134 U
Bromoform	µg/m ³	0.206 U	0.206 U
Carbon Tetrachloride	µg/m ³	0.490	0.553
Chlorobenzene	µg/m ³	0.0920 U	0.0920 U
Chloroform	µg/m ³	0.0980 U	0.322
cis-1,2-Dichloroethene	µg/m ³	0.0790 U	0.0790 U
Ethylbenzene	µg/m ³	0.0870 U	0.568
Isopropylbenzene	µg/m ³	2.46 U	2.46 U
Methyl tert-butyl ether	µg/m ³	0.0720 U	0.0720 U
Methylene Chloride	µg/m ³	1.74 U	1.74 U
Naphthalene	µg/m ³	0.539 J	0.262 UJ
Tetrachloroethene	µg/m ³	318	178
Toluene	µg/m ³	0.188 U	3.95
trans-1,2-Dichloroethene	µg/m ³	0.0790 U	0.0790 U
trans-1,3-Dichloropropene	µg/m ³	0.0910 U	0.0910 U
Trichloroethene	µg/m ³	0.107 U	0.107 U
Vinyl Chloride	µg/m ³	0.0510 U	0.0510 U
Xylenes (total)	µg/m ³	0.273	1.81

Notes:

U - Constituent not detected

µg/m³ - micrograms per cubic meter

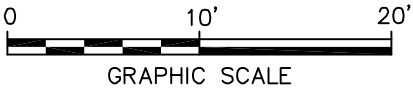



LEGEND:

- ⊕ SUB-SLAB AND INDOOR AIR SAMPLING LOCATIONS
- OUTDOOR AMBIENT AIR SAMPLING LOCATION
- x— FENCE
- [F] FURNACE
- [W] WASHER
- [D] DRYER
- (H) HOT WATER HEATER
- (S) SEWER

NOTE:

1. ALL LOCATIONS ARE APPROXIMATE.



UNIFIRST CORPORATION WOBURN, MA	
INDOOR AIR QUALITY AND VAPOR INTRUSION ASSESSMENT: REPORT OF RESULTS	
RESIDENCE SAMPLE LOCATIONS MARCH 2011	
	FIGURE 1



Appendix A

Sampling Logs



ARCADIS

Indoor Air Sample Collection Log

		Sample ID:	IA-1
		Outdoor/Indoor:	Indoor
Client:	UniFirst	Sample Intake Height:	4'
Project:	Wells G & H offsite	Tubing Information:	NA
Location:	Doburn, MA	Miscellaneous Equipment:	—
Project #:	MA000989.2-3	Time On/Off:	1748
Samplers:	MW/MK	Subcontractor:	—
Sample Point Location:	REDACTED Basement		

Instrument Readings:

Date	Time	Canister Vacuum (a) (inches of Hg)	Temperature (°F or °C)	Relative Humidity (%)	Air Speed (ft/min)	Barometric Pressure (inches of Hg)	PID (ppb)
3/10/2011	1748	-29.64	51.6°F	69.5%	0	30.20	—
3-11-11	1642	-4.82	62.0°F	69.0%	0	29.68	

(a) Record canister information at a minimum at the beginning and end of sampling

SUMMA Canister Information:

Size (circle one):	1 L	(6 L)
Canister ID:	443	
Flow Controller ID:	373	
Notes:		

General Observations/Notes:

Resident smoking in Basement during sampling
Picture 100-0019 is of this canister



ARCADIS

Indoor Air Sample Collection Log

Sample ID:		IA-2 / Dup IA-3 10-2011	
Client:	UniFirst	Outdoor/Indoor:	Indoor
Project:	Wells G & H Offsite	Sample Intake Height:	3'
Location:	Woburn, MA	Tubing Information:	—
Project #:	MA000989.2.3	Miscellaneous Equipment:	—
Samplers:	MW / MK	Time On/Off:	1751
Sample Point Location:	REDACTED Basement	Subcontractor:	—

Instrument Readings:

IA-2 Dup

Date	Time	Canister Vacuum (a) (inches of Hg)	Temperature (°F or °C)	Relative Humidity (%)	Air Speed (ft/min)	Barometric Pressure (inches of Hg)	PID (ppb)
3/10/2011	1751	-28.9 -30	58°F	61.2%	0	30.21	—
3/11/2011	1647	-8.2 -0.12	62°F	64%	0	29.68	—

(a) Record canister information at a minimum at the beginning and end of sampling

SUMMA Canister Information:

Size (circle one):	IA-2 1 L	Dup 6 L
Canister ID:	991	1695
Flow Controller ID:	214	320
Notes:		

General Observations/Notes:

Resident SMOKING IN Basement (Passed Through) during Sampling
Photo 100-0020 is of Both Cans
Of Duplicate Sample went to zero; will be scrapped if zero in lab



Subslab Soil Vapor Sample Collection Log

Client: UniFirst		Sample ID: SS-1
Project: Wells G & H, Woburn, MA		Boring Equipment: Drill
Location: 10 Monetta St		Sealant: clay & hydraulic cement
Project #: MA000909.2-3		Tubing Information: Teflon
Samplers: MW / mk		Miscellaneous Equipment: purge pump
Sample Point Location: REDACTED		Subcontractor: -
Sampling Depth: 3" s/sub		Equipment:
Time and Date of Installation: 3/5/2011 1000		Moisture Content of: Dry
		Approximate Purge Volume: 50ml

Instrument Readings:

→ 1 min at 50ml/min

Date	Time	Canister Vacuum (a) (inches of Hg)	Temperature (°F or °C)	Relative Humidity (%)	Air Speed (ft/min)	Barometric Pressure (inches of Hg)	PID (ppb)
3/11/2011	1751	28.95	56.2°F	66.0	0	29.67	
3-11-2011	1821	5.6	62.5°F	56.2	0	29.68	

(a) Record canister information at a minimum at the beginning and end of sampling

SUMMA Canister Information:

Size (circle one):	1 L (6 L)
Canister ID:	771
Flow Controller ID:	068
Notes:	

Tracer Test Information (if applicable):

Initial Helium Shroud:	46%
Final Helium Shroud:	47%
Tracer Test Passed:	Yes No
Notes:	No Helium in Purge line air

General Observations/Notes:

Approximating One-Well Volume (for purging):

When using 1¼-inch "Dummy Point" and a 6-inch sampling interval, the sampling space will have a volume of approximately 150 mL. Each foot of ¼-inch tubing will have a volume of approximately 10 mL.



Subslab Soil Vapor Sample Collection Log

Sample ID: SS-2	
Client: UniFirst	Boring Equipment: Drill
Project: Wells G & H	Sealant: Teflon tape & clay
Location: Woburn, MA	Tubing Information: Teflon
Project #: MA000909.2.3	Miscellaneous Equipment: Purge Pump, He detector
Samplers: MW/MK	Subcontractor: —
Sample Point Location: ^{REDACTED} Basement	Equipment: —
Sampling Depth: 1" concrete slab	Moisture Content of: Dry
Time and Date of Installation: Temporary point - installed 3/11/2011 1730	Approximate Purge Volume: 50ml

Instrument Readings:

Date	Time	Canister Vacuum (a) (inches of Hg)	Temperature (°F or °C)	Relative Humidity (%)	Air Speed (ft/min)	Barometric Pressure (inches of Hg)	PID (ppb)
3/11/2011	1830	-29.38"	65.2	79.6%	0	29.67	0
	1845	-18.35"			0	29.67	
	1900	-5.7"	55.9°F	65.8%	0	29.67	

(a) Record canister information at a minimum at the beginning and end of sampling

SUMMA Canister Information:

Size (circle one):	1 L <u>6 L</u>
Canister ID:	1524
Flow Controller ID:	006
Notes:	

Tracer Test Information (if applicable):

Initial Helium Shroud:	44%
Final Helium Shroud:	44%
Tracer Test Passed:	<u>Yes</u> No
Notes:	3000-6000ppm He in Purge

General Observations/Notes:

- Purge 50ml/min for 1min
- Fit of tubing/Teflon tape with slab was very tight
- Slight leakage expected through slab, only 1" thick

Approximating One-Well Volume (for purging):

When using 1/4-inch "Dummy Point" and a 6-inch sampling interval, the sampling space will have a volume of approximately 150 mL. Each foot of 1/4-inch tubing will have a volume of approximately 10 mL.



ARCADIS

Indoor Air Sample Collection Log

		Sample ID:	AA-1
		Outdoor/Indoor:	Out Door
Client:	UniFirst	Sample Intake Height:	3' 6"
Project:	Wells G & H Offsite	Tubing Information:	—
Location:	Woburn, MA	Miscellaneous Equipment:	—
Project #:	MA000989.2.3	Time On/Off:	1742
Samplers:	MW / MK	Subcontractor:	—
Sample Point Location:	REDACTED Back Yard Near Swing Set		

Instrument Readings:

Date	Time	Canister Vacuum (a) (inches of Hg)	Temperature (°F or °C)	Relative Humidity (%)	Air Speed (ft/min)	Barometric Pressure (inches of Hg)	PID (ppb)
3-10-11	5:30/1742	-30"	42°F	82.7	3 mph	30.19	
3-11-11	1650	5.03	54.5°F	89.5	1 mph	29.68	

(a) Record canister information at a minimum at the beginning and end of sampling

SUMMA Canister Information:

Size (circle one):	1 L (6 L)
Canister ID:	939
Flow Controller ID:	477
Notes:	

General Observations/Notes:

3-11-11	W Sample Upwind of Home Wind Direction same as 3-10-11 Photo 100-0021 is of both Canister AA-1, also 100-0032



Appendix B

Building Survey and Product
Inventory Field Form

THE JOHNSON COMPANY, INC.

100 State Street, Suite 600
Montpelier, Vermont 05602
(802) 229-4600

SOP-JCO-063-002**DRAFT**

Page 1 of 4

Indoor Air Quality Building SurveySampler: Mitch Wacksman Date: ~~Feb 5, 2011~~ March 5, 2011 PO #: _____Address: ^{RED}ACT _____Woburn, MA
^{REDACTED}

Contact Name: _____

List of Current Occupants/Occupation:

Age (if under 18)	Sex (m/f)	Occupation
<u>47</u>	<u>M</u>	<u>Boston Steel - Manufacturing - Clothes Shop</u>
<u>Born 4 1/2</u>	<u>M</u>	
<u>13 months</u>	<u>F</u>	
<u>15 yrs</u>	<u>F</u>	
<u>40 yrs</u>	<u>F</u>	<u>Accountant</u>

at Clarke, Linn & Son**Building Construction Characteristics:**

What type of building is it? (Circle appropriate responses)

- ☒ Single Family ☐ Multi-Family ☐ School ☐ Commercial ☐ Industrial
- ☒ Ranch ☐ 2-Family
☐ Raised Ranch ☐ Duplex
☐ Cape ☐ Apartment House (# of units _____)
☐ Colonial ☐ Condominium (# of units _____)
☐ Split Level ☐ Other (specify) _____
☐ Mobile Home

General description of building construction materials: Block Wall Stick BuiltNumber of occupied stories: 2 Year built? 1950's

Has the building been weatherized with any of the following? (Circle all that apply)

Insulation Storm windows Energy-efficient windows Other (specify) _____

Attached garage? (Y/N) Y Vehicle(s) present? (Y/N) Y

Source: MaDEP, 2002, "Indoor Air Sampling and Evaluation Guide, WSC Policy #02-430", Office of Research and Standards, Massachusetts Department of Environmental Protection, April, 2002.

THE JOHNSON COMPANY, INC.

100 State Street, Suite 600
Montpelier, Vermont 05602
(802) 229-4600

SOP-JCO-063-002

DRAFT

Page 2 of 4

What type of basement does the building have? (Circle all that apply)

Full basement Crawlspace Slab-on-grade Other (specify)

What are the characteristics of the basement? (Circle all that apply)

Finished	<u>Basement Floor:</u>	<u>Foundation Walls:</u>	<u>Moisture:</u>
Unfinished	<u>Concrete</u>	Poured concrete	Wet
<u>Partially finished (%) 70%</u>	Dirt	<u>Block</u>	Damp
	Other (specify)	Field stone	<u>Dry</u>

Is a basement sump present? (Y/N) Y - Clean out only Is sump sealed to indoor air? (Y/N) N Y, concrete Bottom and Sides
Does the basement have any of the following characteristics (e.g., preferential vapor pathways) that might permit soil vapor entry? (Circle all that apply)

Cracks Pipe/utility conduits Other (specify) - Floor Appears to be poured in sections, many joints
Foundation/slab drainage NO Oil supply for Furnace Sump pumps

Heating and Ventilation System(s) Present:

What types of heating system(s) are used in this building? (Circle all that apply)

Hot air circulation Heat pump Steam Radiation Wood stove
Other (specify) Air conditioner (central/window) Fireplace (wood/gas)

What types of fuels are used in this building? (Circle all that apply)

Natural gas Electric Coal Other (specify)
Fuel oil Wood Solar

What type of mechanical ventilation systems are present and/or currently operating in this building?

(Circle all that apply)

Central air conditioning Mechanical fans Bathroom vent fan
Individual air conditioning Kitchen range hood Air-to-air heat exchanger
Open windows Other (specify)

Sources of Chemical Contaminants:

Source: MaDEP, 2002, "Indoor Air Sampling and Evaluation Guide, WSC Policy #02-430", Office of Research and Standards, Massachusetts Department of Environmental Protection, April, 2002.

THE JOHNSON COMPANY, INC.

100 State Street, Suite 600
Montpelier, Vermont 05602
(802) 229-4600

SOP-JCO-063-002**DRAFT**

Page 3 of 4

Which of these are present in the building?

Potential VOC Source	Location of Source	Major Ingredients	Removed Prior to Air Sampling (Y/N/NA)
Paint or paint thinners			
Gas-powered equipment	Garage - Car		
Gasoline storage cans			
Cleaning solvents			
Air fresheners			
Oven cleaners			
Carpet/ upholstery cleaners			
Hairspray			
Nail polish/ remover	Basement	Isopropyl Alcohol	
Bathroom cleaner			
Appliance cleaner			
Furniture/ floor polish			
Moth balls			
Fuel oil tank	Outside, Small Leak in Tubing, Catch can in Basement		
Wood stove			
Fireplace			
Perfume/ colognes			
Hobby supplies	Fe Basement, Temper Paint	Rich Art Fresco Temper Paint	2x16:2
Scented potpourri, etc		Rich Art Clean Colors Air Freshener	2x16:2
Brake cleaner			
Liquid Wrench			
Other			
Other			
Other			

Do one or more smokers occupy this building on a regular basis? YesHas anyone smoked in the building in the last 48 hours? (Y/N) No - Cigarette butts in basementDo the occupants frequently have clothes dry-cleaned? (Y/N) NoAny recent remodeling or repainting (Y/N, describe) No

Any obvious pressed wood products (e.g. hardwood plywood paneling, particleboard, fiberboard)? (Y/N) .

Are there any new upholstery, drapes, carpets, or other textiles? (Y/N) New Carpet & Hardware on First Floor 6-16-02

Source: MaDEP, 2002, "Indoor Air Sampling and Evaluation Guide, WSC Policy #02-430", Office of Research and Standards, Massachusetts Department of Environmental Protection, April, 2002.

THE JOHNSON COMPANY, INC.

100 State Street, Suite 600
Montpelier, Vermont 05602
(802) 229-4600

SOP-JCO-063-002

DRAFT

Page 4 of 4

Has the building been treated with any insecticides/pesticides? If so, how often and what chemicals were used? NO

Do any of the occupants apply pesticides/herbicides in the yard or garden? If so, how often and what chemicals are used? NO

Outdoor Sources of Contamination:

Is there any stationary emission source in the vicinity of the building? 2 GW System
UNI First, Across Street,
Highway Nearby

Are there any mobile emission sources (e.g., highway; bus stop; high-traffic area) in the vicinity of the building?

Highway 93 & 95 very close. Heavy traffic on Olympia
and Washington

Weather Conditions During Sampling:

Outside Temperature (°F): 50°

Prevailing wind direction: Wind blowing towards from South

Describe the general weather conditions (e.g., sunny, cloudy, rain):

Overcast

Was there any significant precipitation (0.1 inches) within 12 hours preceding the sampling event? NO

Type of ground cover (e.g., grass, pavement, etc.) outside the building: Grass & Pavement

General Comments

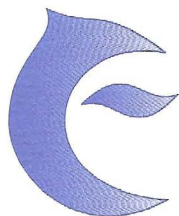
Is there any other information about the structural features of this building, the habits of its occupants or potential sources of chemical contaminants to the indoor air that may be of importance in facilitating the evaluation of the indoor air quality of the building?

Condition of floor is very thin



Appendix C

Data Validation Report



Phoenix Chemistry Services

April 28, 2011

Nadine Weinberg
ARCADIS, U.S., Inc.
482 Congress Street, Suite 501
Portland, ME 04101

Reference #: 2011-0330-001-10M

Dear Nadine,

Enclosed please find the results of the data validation of Sample Delivery Group No. L1103364 from the Indoor Air Quality/Vapor Intrusion (IAQ/VI) assessment work at a residential property in Woburn, MA. The indoor and outdoor air and sub-slab vapor samples in SDG No. L1103364 were collected on March 10 - 11, 2011. The laboratory analyses were performed by Alpha Analytical Laboratories, Inc. of Mansfield, MA.

The data package and an electronic deliverable were received on March 30 and 31, 2011, and a separate data package for the canister certifications (SDG No. L1102539) was received on April 12, 2011. The validation has been performed by Phoenix Chemistry Services according to the Tier III guidelines as defined by USEPA Region I, as presented in "Region I EPA-NE Data Validation Functional Guidelines for Evaluating Environmental Analyses", December, 1996. The EPA's National Functional Guidelines for Organic Data Review (EPA 540/R-99/008, October, 1999), the IAQ/VI Quality Assurance Project Plan (QAPP), and the Field-Laboratory Coordination Memorandum (Phoenix Chemistry Services, March 25, 2010) were also considered during the evaluation, and professional judgment was applied as necessary and appropriate. Data qualifiers have been applied in the final validation report as necessary and appropriate, in accordance with these guidelines.

Thank you for this opportunity to provide data validation services to ARCADIS. We look forward to continuing to work with you on this and other projects. If there are any questions or concerns about the material in this report, please do not hesitate to contact me for help and clarification.

Sincerely,

Deborah H. Gaynor, Ph.D.
Principal, Phoenix Chemistry Services

DATA VALIDATION

FOR

**UniFirst-Woburn Vapor Intrusion Assessment
UniFirst Property
Woburn, MA**

**ORGANIC ANALYSIS DATA
Selected Volatiles in Air Samples**

**Sample Delivery Group (SDG) No.
L1103364: 10M**

Chemical Analyses Performed by:

**Alpha Analytical Laboratories, Inc.
320 Forbes Blvd.
Mansfield, MA 02048**

FOR

**ARCADIS U.S., Inc.
482 Congress Street, Suite 501
Portland, ME 04101**

Data Validation Report by:

**Phoenix Chemistry Services
126 Covered Bridge Rd.
N. Ferrisburg, VT 05473
(802) 233-2473
April 28, 2011**

EXECUTIVE SUMMARY

Phoenix Chemistry Services (Phoenix) has completed the validation of the Method TO-15 Selected Ion Monitoring (SIM) volatiles in air analysis data prepared by Alpha Analytical Laboratories of Mansfield, MA, for 5 air samples and one (1) trip blank (TB) from a residential property in Woburn, MA. The laboratory reported the data under Sample Delivery Group (SDG) No. L1103364, which was submitted as a single data package received by Phoenix on March 30, 2011, and includes the following samples:

Sample Location	Sample ID	Laboratory ID
IA-10M-1	IA-1	L1103364-01
AA-10M-1	AA-1	L1103364-02
SS-10M-1	SS-1	L1103364-03
SS-10M-2	SS-2	L1103364-04
IA-10M-2	IA-2	L1103364-05

A cross-reference table of sample IDs was provided in the data package. The Sample Location name is being presented in this sample list to aid in identifying project samples with non-unique Sample IDs. The location name will be given as needed in this report to maintain clarity. A separate data package, L1102539, containing the supporting documentation (clean can certifications) for the preparation and analysis of the sampling canisters was submitted on April 12, 2011.

The samples in this data set represent the indoor air and the sub-slab soil vapor samples (matched to the indoor sampling locations) collected from March 10 to 11, 2011 in Woburn, MA inside a residential building identified as location 10M, and an ambient air sample collected outdoors at the sample location. All samples were kept in the engineer's custody after sampling until hand-delivered by laboratory courier to the laboratory on March 15, 2011.

Findings of the validation effort resulted in the following qualifications of sample results:

- Results for naphthalene in all samples analyzed by Method TO-15 SIM were qualified as estimated (J, UJ).
- The result for tetrachloroethene in sample SS-1 (at location SS-10M-1) was rejected (R) and replaced with the acceptable concentration from the more diluted analysis of sample SS-1DL (at location SS-10M-1).
- The laboratory appropriately applied "J" qualifiers to the CLP-like sample Form 1s when the concentration of an analyte was less than the sample-specific QL for the analytes naphthalene, 1,2-dibromoethane, and bromodichloromethane (none were reported in this data set).

The Overall Evaluation of Data (Section XVI) summarizes the validation results. The validation findings and conclusions for each analytical parameter are detailed in the remaining sections of this report.

Documentation problems observed in the data package are described in Section XVII.

This validation report shall be considered part of the data package for all future distributions of TO - 15 SIM (volatiles in air) analysis data for the residential property reported in SDG No. L1103364.

INTRODUCTION

Analyses of selected volatiles in air samples were performed according to Method TO-15, as modified for Selected Ion Monitoring (SIM) in the laboratory standard operating procedure (SOP) No. A-001, and in accordance with requirements in the Quality Assurance Project Plan (QAPP) for Indoor Air Quality and Vapor Intrusion Assessment, Rev. 2, March, 2010. The target compound list was limited to the compounds listed in Form K of the QAPP, and reporting limits are as specified there.

Tentative identification of non-target analyte peaks (i.e., tentatively identified compounds, or TICs) was not requested for these analyses.

Phoenix's validation was performed in conformance with Tier III guidelines as defined by USEPA Region I. Data qualifiers are applied as necessary and appropriate. To the extent possible, the data were evaluated in accordance with the "Region I EPA-NE Data Validation Functional Guidelines for Evaluating Environmental Analyses", December, 1996. EPA's National Functional Guidelines for Organic Data Review (EPA 540/R-94/012, 2/94) and the QAPP were also considered during the evaluation, and professional judgment was applied as necessary and appropriate.

The data validation process evaluates data on a technical basis for chemical analyses conducted under the USEPA Contract Laboratory Program (CLP) or other well-defined methods. Contract compliance is evaluated only in specific situations. Issues pertaining to contractual compliance are noted where applicable. It is assumed that the data package is presented in accordance with the CLP requirements. It is also assumed that the data package represents the best efforts of the laboratory and has already been subjected to adequate and sufficient quality review prior to submission for validation.

Results of sample analyses are reported by the laboratory as either qualified or unqualified; various qualifier codes are used by the laboratory to denote specific information regarding the analytical results. During the validation process, laboratory data are verified against all available supporting documentation. Based on this evaluation, qualifier codes may be added, deleted or modified by the data validator. Raw data is examined in detail to check calculations, compound identification, and/or transcription errors. Validated results are either qualified or unqualified; if results are unqualified, this means that the reported values may be used without reservation. Final validated results are annotated with the following codes, as defined in the EPA Region I Functional Guidelines:

- U - The analyte was analyzed for, but was not detected. The associated numerical value is the sample quantitation limit. The sample quantitation limit accounts for sample specific dilution factors and percent solids corrections or sample sizes that deviate from those required by the method.
- J - The associated numerical value is an estimated quantity.
- UJ - The analyte was analyzed for, but was not detected. The sample quantitation limit is an estimated quantity.
- R - The data are unusable (analyte may or may not be present). Resampling and reanalysis is necessary for verification. The R replaces the numerical value or sample quantitation limit.

In some instances (e.g., a dilution) a result may be indicated as “rejected” to avoid confusion when a more quantitatively accurate result is available.

EB, TB, BB - An analyte that was identified in an aqueous equipment (field) blank, trip blank, or bottle blank that was used to assess field contamination associated with soil/sediment samples. These qualifiers are to be applied to soil/sediment sample results only.

These codes are assigned during the validation process and are based on the data review of the results. They are recorded in the “Validator_Qualifier” column, and are also found with the validated laboratory-applied qualifiers in the “Qualifier” column in the electronic spreadsheet contained in Attachment A.

All data users should note two facts. First, **the "R" qualifier means that the laboratory-reported value is completely unusable.** The analysis is invalid due to significant quality control problems, and provides no information as to whether the compound is present or not. Rejected values should not appear on data tables because they have no useful purpose under any circumstances. Second, **no analyte concentration is guaranteed to be accurate even if all associated quality control is acceptable.** While strict quality control conformance provides well-defined confidence in the reported results, any analytical result will always contain some error.

The user is also cautioned that the validation effort is based on the materials provided by the laboratory. Software manipulation, resulting in misleading raw data printouts, cannot be routinely detected during validation; unless otherwise stated in the report, these kinds of issues are outside the scope of this review.

Detailed Findings of Measurement Error Associated with the Analytical Analysis

I. Sample Integrity

The indoor air samples at the residential location “10M” for volatiles analysis were collected over an approximately 24-hour period from March 10 to 11, 2011, and the matching sub-slab (soil vapor) samples were collected during the late afternoon of March 11, 2011 for an approximately 30-minute period. An ambient air sample was collected outdoors at this location on March 10, 2011. The property is located in Woburn, MA. All analyses were performed within thirteen (13) days after sample collection, which is within the 30 day holding time defined in Method TO-15.

The canisters were delivered by laboratory courier to the field sampler’s possession prior to the sample collection period; however, the custody transfer was not recorded on the Chain of Custody documents as required in the Field-Laboratory Coordination Memorandum (Phoenix Chemistry Services, March 25, 2010). The canisters were hand-delivered by laboratory courier to the laboratory three days after collection ended; the canisters were kept in the field engineer’s office during the intervening days. A separate data package, L1102539, was submitted on April 12, 2011, containing the supporting documentation (clean can certification) for the preparation and analysis of the sampling canisters.

The Chain of Custody (COC) and the Canister and Flow Controller Information records show that the sample canisters were collected and transported according to method specifications, with the following exceptions:

Table 1. Sampling Equipment Exceedances

Sample ID	Flow Controller ID	Rate on release (mL/min)	Rate on return (mL/min)	Change	Final Vacuum* (inches Hg)	Field Sample Location
DUPIA-3-10-2011	320	3.3	6.0	+58 %	0.6	IA-10M-1

*as measured at the laboratory following sample receipt; field measurements showed slightly greater vacuum.

All canisters submitted to the field for use met all applicable method requirements, with the exception of one canister that was not used due to equipment failure, and one canister (sample DUPIA-3-10-2011), which went to ambient pressure before collection ended, so the analysis was cancelled. The flow controller rate exceedances for this sample were properly noted in the Case Narrative. The Case Narrative notes that the canister which was not used due to equipment failure was incorrectly referenced in the chain of custody document, and the canister used as the trip blank was recorded instead. Based on otherwise acceptable sampling equipment conditions at receipt, and the corrected sample identification for the Trip Blank, sample integrity was deemed acceptable for all samples. Raw data for the canister vacuum and flow controller checks following sample receipt was not included in the data package; the validator has requested that the laboratory provide the date these measurements were taken, and assert that the raw data is properly archived.

Correspondence between the laboratory and the field sampler is contained in the data package which explains the correction for the sample identification error on the chain of custody documents. Review of these corrections was performed during the validation effort.

Field log books containing records of height of canister intake, barometric pressure, and ambient temperature at sampling locations were submitted for review as part of this validation effort, and are complete and acceptable.

II. GC/MS Instrument Performance Check (Tuning)

The samples for volatiles in air analyses from SDG No. L1103364 were analyzed on a single GC/MS system identified as instrument Airpiano2. The tuning of this instrument was demonstrated with analysis of 4-bromofluorobenzene (BFB); tunes were analyzed for each 24-hour period during which the samples or associated standards were analyzed. All four (4) BFB tunes were correctly calculated, within acceptance limits, and are reported accurately on the Form 5 summaries in the data package.

III. Initial Calibration (IC)

One IC (1/14/11, 17:38 – 23:48) was performed on instrument Airpiano2 in support of the TO-15 SIM sample analyses. The IC was performed at ten concentration levels (0.02, 0.04, 0.1, 0.2, 0.5, 1.0, 2.5, 5.0, 10, and 50 part per billion by volume [ppbv]). Documentation of all individual IC standards was present in the data package and relative response factor (RRF) as well as percent relative standard deviation (%RSD) values were correctly calculated and accurately reported on the Form 6 summary.

Manual integrations for some target analytes, internal standards, or surrogate standards were performed in some standards and samples in this data set. The before and after ion chromatograms, the reason for the manual integration, and the analyst's initials and date were printed for each manual integration.

All average RRF values were above the 0.05 minimum criterion, and all %RSDs were below the maximum limit (30%) specified by Region I, with the exception that naphthalene exhibited a 34.78%RSD in the TO-15 IC.

An Independent Calibration Verification (ICV) sample analysis at 5 ppbv was analyzed after the IC. All spiked analytes were recovered within 70 – 130 % recovery of expected values in the ICV analysis.

On the basis of the unacceptably high %RSD value in the associated IC, results for naphthalene in all samples analyzed by Method TO-15 were qualified as estimated (J, UJ).

IV. Continuing Calibration (CC)

Two continuing calibration (CC) standards were run in support of the T)-15 SIM sample analyses reported in this data package. Documentation of the CC standards was present and RRF as well as percent difference (%D) values were reported on the Form 7 summaries within the data package. Sample results were properly reported using the average RRF of the calibration curve for quantitation.

It should be noted that a positive % D value (the CC response factor is less than the IC response factor) will result in a low bias for positive detects, and a negative % D will result in a high bias for positive detects.

V. Blanks

Results for two air-matrix laboratory method blanks (MBs) were reported in association with the TO-15 SIM sample analyses. No target compounds were found in either MB.

One trip blank (TB), which was used as a field blank, was reported in this data package. No target compounds were found in the TB, with the exception that 0.211 ug/m³ toluene was detected in sample Trip Blank.

Neither a trip blank nor a field blank is required for Method TO-15, and there are no established guidelines for qualification on the basis of an air matrix trip blank or field blank. On the basis of professional judgment, an action limit (0.422 ug/m³ for toluene) of twice the detected concentration in the TB was used for qualification based on field contamination.

Since toluene was not reported in any samples in this data set at concentrations greater than the sample-specific (adjusted) quantitation limit (QL) but less than the action limit, no qualifications were required on the basis of field contamination.

VI. Surrogate Compounds

No surrogate compounds are used in these methods.

VII. Internal Standards (IS)

All IS areas and retention times (RT) were within the established QC limits for all reported sample analyses in this data package.

VIII. Laboratory Duplicates

A matrix spike/matrix spike duplicate (MS/MSD) analysis is not used in this method. A laboratory duplicate analysis of a field sample (matrix duplicate) analysis is also not required but was performed per laboratory protocols. Sample SS-2 at location SS-10M-2 was reported for laboratory duplicate analysis. Relative percent difference (RPD) values were reported on a Form 3 summary within the data package.

Precision in the laboratory duplicate analyses (range: 0 - 18 %RPD) was acceptable (less than 30 % RPD, for all analytes greater than five times the reporting limit) on the basis of professional judgment.

IX. Field Duplicates

No field duplicates were collected at this sample location, so field precision could not be evaluated for this sample set.

X. Sensitivity Check

An MDL study for the TO-15 SIM method was analyzed by the laboratory on May 7, 2009, and the most recent verification study was performed between on February 3 and 4, 2010. All target analytes in the statistical study had calculated MDLs below the method quantitation limits (QLs), and demonstrated acceptable ratios (at least 3:1) of the QL to the MDL. The QLs are also supported by the low concentration standard (at 0.020 ppbv) in the initial calibration.

Project objectives required a low reporting limit (RL) for naphthalene, and in order to achieve project objectives for detection limits, the analytes 1,2-dibromoethane (EDB), bromodichloromethane, and naphthalene were evaluated by the laboratory down to one-half the RL; concentrations between one-half the RL and the RL were reported with a "J" qualifier to indicate that this was an estimated concentration on the Form 1 summaries; none were reported in this sample set.

On the basis of acceptable sensitivity and accuracy, as demonstrated by the MDL study and supported by the initial calibration, all results for the TO-15 SIM method (detects and non-detects) not qualified for other reasons are deemed acceptable as reported.

XI. Performance Evaluation Samples (PES)/Accuracy Check

Two zero blind PE samples (commonly known as a laboratory control sample, LCS) were prepared and analyzed by the laboratory in support of the TO-15 SIM sample analyses. All target analytes were spiked into the QC samples at 5 ppbv. Percent recoveries (%R) were correctly calculated for the spiked compounds, accurately reported on the Form 3 summaries in the data package, and were within the laboratory established QC limits (70 - 130 %R) for all target analytes. No spiked duplicate analyses were performed for either method, so laboratory precision was not evaluated using spiked analyses.

No external single-blind PES sample for either method was required or submitted with the samples in this data set.

XII. Target Compound Identification

Reported target compounds were correctly identified for all samples in this data set.

XIII. Compound Quantitation and Reported Quantitation Limits

Target compound quantitation and practical quantitation limits (PQLs) were accurately reported on the Form 1 summaries. Results below the RL are not reported by the laboratory for this method. However, at the client's request, positive results for naphthalene, bromodichloromethane, and 1,2-dibromoethane (EDB) were evaluated down to one-half the RL, and reported with a "J" qualifier by the laboratory on the Form 1s.

One compound was reported with reporting limits slightly higher than specified in the QAPP. Total xylenes were reported with a quantitation limit of 0.260 ug/m³. No qualifications were deemed necessary on

the basis of the RL slightly above that specified in the QAPP for total xylenes, since this concentration is still well below the risk screening level.

On the basis of screen results, original dilutions were performed for one sub-slab sample for tetrachloroethene concentration above the linear calibrated range of the instrument. No dilution was required for any indoor or outdoor air samples, or for sub-slab sample SS-2 at location SS-10M-2.

Tetrachloroethene was detected above the calibration range in the original analysis of sample SS-1 (at location SS-10M-1). The sample was appropriately reanalyzed at a greater dilution, bringing the concentration of tetrachloroethene within the upper half of the calibration range, and both sets of analyses were reported in the data package. Only the tetrachloroethene result was reported from the more diluted sample analysis.

The result for tetrachloroethene in sample SS-1 (at location SS-10M-1) was rejected (R) due to detection of this compound outside the linear range of the instrument for method TO-15 SIM. The result for tetrachloroethene was replaced with the acceptable concentration from the more diluted analysis of sample SS-1DL (at location SS-10M-1)

“E” qualifiers were appropriately applied by the laboratory to sample Form 1 results when concentrations of target analytes were greater than the instrument calibration range.. The validator removed all laboratory-applied “E” qualifiers. Only the analyte originally detected above the calibration range was reported in the dilution analysis “D” qualifiers were not applied to the results in the dilution analysis, nor was the sample ID given the “DL” suffix as required in standard CLP reporting.

The laboratory appropriately applied “J” qualifiers to the CLP-like sample Form 1s when the concentration of an analyte was less than the sample-specific QL for the analytes naphthalene, 1,2-dibromoethane, and bromodichloromethane in the TO-15 SIM analysis. The validator did not remove these qualifiers (none were reported in this sample set).

The values that the validator has judged to be acceptable are presented on the electronic deliverable generated from the project database (Attachment A). Qualifiers applied by the validator during the validation effort have been listed on the electronic spreadsheet in an additional column labeled “Validator_Qualifier”. The column labeled “Qualifier” contains both qualifiers applied by the laboratory and those applied by the validator; all qualifiers in this column have been accepted or changed during the validation effort. The column labeled “PreValidationFlag”, which is generated by the database utility, also indicates which qualifiers were changed by the validator. Sample-specific quantitation limits may be found on the Form 1 for each sample or in the electronic deliverable (Attachment A, column “ReportingLimit”).

The Form 1s submitted in the data package present results in units of $\mu\text{g}/\text{m}^3$ as well as in ppbv. Results are also presented almost entirely in units of $\mu\text{g}/\text{m}^3$ in the electronic data deliverable (EDD). Both the forms and the EDD were examined during the data validation process.

All positive results are listed on the electronic data deliverable, whether or not the value or qualifier was changed as a result of the validation. All non-detected results are listed on the electronic data deliverable with a Qualifier of “U” or “UJ”; these are also found as less-than (<) values in the “TextResult” column. If the reported result value was changed during the validation effort from a positive result to a value representing a concentration not detected at or below, the value representing the new reporting limit is

reported as the Result with a Validator Qualifier of “U” or “UJ” and a “<” sign in the “TextResult” column.

XIV. Tentatively Identified Compounds (TICs)

Evaluation of unidentified, non-target analyte peaks was not requested or performed for these samples.

XV. System Performance

The analytical system appears to have been working acceptably, based on instrument printouts and spectral quality.

XVI. Overall Evaluation of Data

Findings of the validation effort resulted in the following qualifications:

- On the basis of the unacceptably high %RSD value in the associated IC, results for naphthalene in all samples analyzed by Method TO-15 SIM were qualified as estimated (J, UJ).
- The result for tetrachloroethene in sample SS-1 (at location SS-10M-1) was rejected (R) due to detection of this compound outside the linear range of the instrument for method TO-15 SIM. The result for tetrachloroethene was replaced with the acceptable concentration from the more diluted analysis of sample SS-1DL (at location SS-10M-1).
- The laboratory appropriately applied “J” qualifiers to the CLP-like sample Form 1s when the concentration of an analyte was less than the sample-specific QL for the analytes naphthalene, 1,2-dibromoethane, and bromodichloromethane in the TO-15 SIM analysis. The validator did not remove these qualifiers.

XVII. Documentation

The required records for canister cleanliness were submitted as a separate data package, SDG No. L1102539, and all required records were properly included with this data package. Canister cleanliness and auxiliary equipment status was acceptable upon release from the laboratory, and appropriate checks and actions were performed as required upon sample and equipment receipt.

The chain of custody (COC) records were present and accurately completed for all reported samples, with the following exception:

- The canisters were delivered by laboratory courier to the field sampler’s possession, according to communication from the ARCADIS field engineer; however, the custody transfer was not recorded on the Chain of Custody documents as required in the Field-Laboratory Coordination Memorandum (Phoenix Chemistry Services, March 25, 2010). For future sampling efforts, it is

recommended that the laboratory COC record be initiated at the time of release of the canisters from the laboratory.

- Improper edits were noted on the COC records. All edits should be made with a single line cross-out and include the date and initials of the person performing the edit.

Data presentation was acceptable, with the following observations and exceptions:

- Raw data for the canister vacuum and flow controller checks following sample receipt was not included in the data package; the validator has requested that the laboratory provide the date these measurements were taken, and assert that the raw data is properly archived.
- The Case Narrative does not include bromodichloromethane in the list of compounds which were evaluated below the standard reporting limit, although this evaluation was performed. The validator requested that the Narrative be revised to include this compound.
- One compound was reported with reporting limits slightly higher than specified in the QAPP. Total xylenes were reported with a quantitation limit of 0.260 ug/m³.

Additional materials and revisions requested by the validator from the laboratory should be appended to the original data package, or should replace the appropriate pages, in accordance with laboratory instructions accompanying these submissions. All revisions and additional submissions should become a permanent part of the data package for all future distributions.

This validation report should be considered part of the data package for all future distributions of the TO-15 SIM (volatiles in air) analysis data for the residential property “10M” under SDG No. L1103364.



Appendix D

Laboratory Analytical Data Package



ANALYTICAL REPORT

Lab Number:	L1103364
Client:	Arcadis 2 Executive Drive Chelmsford, MA
ATTN:	Nadine Weinberg
Phone:	(978) 937-9999
Project Name:	UNIFIRST WELLS G&H
Project Number:	MA000989.0002.0003
Report Date:	03/30/11

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA030), NY (11627), CT (PH-0141), NH (2206), NJ (MA015), RI (LAO00299), ME (MA0030), PA (Registration #68-02089), LA NELAC (03090), FL NELAC (E87814), US Army Corps of Engineers.

320 Forbes Boulevard, Mansfield, MA 02048-1806
508-822-9300 (Fax) 508-822-3288 800-624-9220 - www.alphalab.com



Project Name: UNIFIRST WELLS G&H
Project Number: MA000989.0002.0003

Lab Number: L1103364
Report Date: 03/30/11

Alpha Sample ID	Client ID	Sample Location	
L1103364-01	IA-1	WOBURN, MA	03/11/11 16:42
L1103364-02	AA-1	WOBURN, MA	03/11/11 16:50
L1103364-03	SS-1	WOBURN, MA	03/11/11 18:21
L1103364-04	SS-2	WOBURN, MA	03/11/11 19:00
L1103364-05	IA-2	WOBURN, MA	03/11/11 16:47
L1103364-06	DUP IA-3-10-2011	WOBURN, MA	03/11/11 00:00
L1103364-13	TRIP BLANK	WOBURN, MA	03/12/11 00:00

Project Name: UNIFIRST WELLS G&H
Project Number: MA000989.0002.0003

Lab Number: L1103364
Report Date: 03/30/11

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet all of the requirements of NELAC, for all NELAC accredited parameters. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

For additional information, please contact Client Services at 800-624-9220.

Report Submission

This report replaces the report issued on March 29, 2011. The report has been amended to include the MDL values.

The canister certification results are provided as an addendum.

L1103364-06 (DUPIA-3-10-2011) Client requested that analysis on this sample be canceled. The RPD of the pre- and post-flow controller calibration check (58% RPD) was outside acceptable limits (< or = 20% RPD).

Client indicated that the canisters and flow controllers noted on the COC for samples L1103364-13 and -14 were reversed.

Project Name: UNIFIRST WELLS G&H
Project Number: MA000989.0002.0003

Lab Number: L1103364
Report Date: 03/30/11

Case Narrative (continued)


Volatile Organics in Air (SIM)

1,2-Dibromoethane and Naphthalene were evaluated to 1/2 the RL and are 'J' qualified if the concentration is below the quantitation limit (RDL), but greater than or equal to 1/2 the RDL. Values are estimated.

L1103364-03 was re-analyzed on dilution in order to quantitate the sample within the calibration range. The result should be considered estimated, and is qualified with an E flag, for any compound that exceeded the calibration on the initial analysis. The re-analysis was performed only for the compound that exceeded the calibration range.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature:



Kathleen O'Brien

Title: Technical Director/Representative

Date: 03/30/11

AIR

Project Name: UNIFIRST WELLS G&H**Lab Number:** L1103364**Project Number:** MA000989.0002.0003**Report Date:** 03/30/11**SAMPLE RESULTS**

Lab ID: L1103364-01
Client ID: IA-1
Sample Location: WOBURN, MA
Matrix: Air
Analytical Method: 48,TO-15-SIM
Analytical Date: 03/21/11 15:58
Analyst: BS

Date Collected: 03/11/11 16:42
Date Received: 03/15/11
Field Prep: Not Specified

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air by SIM - Mansfield Lab								
1,1,1-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1,2-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,1-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
1,2,4-Trimethylbenzene	0.791	0.020	0.020	3.88	0.098	0.098		1
1,2-Dibromoethane	ND	0.020	0.010	ND	0.154	0.077		1
1,2-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,2-Dichloropropane	ND	0.020	0.020	ND	0.092	0.092		1
1,3-Butadiene	0.159	0.020	0.020	0.351	0.044	0.044		1
1,3-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
1,4-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
Benzene	1.86	0.070	0.070	5.93	0.223	0.223		1
Bromodichloromethane	ND	0.020	0.010	ND	0.134	0.067		1
Bromoform	ND	0.020	0.020	ND	0.206	0.206		1
Carbon tetrachloride	0.085	0.020	0.020	0.534	0.126	0.126		1
Chlorobenzene	ND	0.020	0.020	ND	0.092	0.092		1
Chloroform	0.104	0.020	0.020	0.507	0.098	0.098		1
cis-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
Ethylbenzene	0.576	0.020	0.020	2.50	0.087	0.087		1
Methylene chloride	ND	0.500	0.500	ND	1.74	1.74		1
Methyl tert butyl ether	ND	0.020	0.020	ND	0.072	0.072		1
Naphthalene	0.170	0.050	0.025	0.890	0.262	0.131		1
XYLENE (TOTAL)	3.32	0.060	0.060	14.4	0.260	0.260		1
Tetrachloroethene	0.080	0.020	0.020	0.542	0.136	0.136		1
Toluene	6.59	0.050	0.050	24.8	0.188	0.188		1



Project Name: UNIFIRST WELLS G&H**Lab Number:** L1103364**Project Number:** MA000989.0002.0003**Report Date:** 03/30/11**SAMPLE RESULTS**

Lab ID: L1103364-01
 Client ID: IA-1
 Sample Location: WOBURN, MA

Date Collected: 03/11/11 16:42
 Date Received: 03/15/11
 Field Prep: Not Specified

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air by SIM - Mansfield Lab								
trans-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
trans-1,3-Dichloropropene	ND	0.020	0.020	ND	0.091	0.091		1
Trichloroethene	ND	0.020	0.020	ND	0.107	0.107		1
Vinyl chloride	ND	0.020	0.020	ND	0.051	0.051		1
Isopropylbenzene	ND	0.500	0.500	ND	2.46	2.46		1

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-difluorobenzene	89		60-140
bromochloromethane	100		60-140
chlorobenzene-d5	91		60-140



Project Name: UNIFIRST WELLS G&H**Lab Number:** L1103364**Project Number:** MA000989.0002.0003**Report Date:** 03/30/11**SAMPLE RESULTS**

Lab ID: L1103364-02
 Client ID: AA-1
 Sample Location: WOBURN, MA
 Matrix: Air
 Analytical Method: 48,TO-15-SIM
 Analytical Date: 03/21/11 16:35
 Analyst: BS

Date Collected: 03/11/11 16:50
 Date Received: 03/15/11
 Field Prep: Not Specified

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air by SIM - Mansfield Lab								
1,1,1-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1,2-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,1-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
1,2,4-Trimethylbenzene	ND	0.020	0.020	ND	0.098	0.098		1
1,2-Dibromoethane	ND	0.020	0.010	ND	0.154	0.077		1
1,2-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,2-Dichloropropane	ND	0.020	0.020	ND	0.092	0.092		1
1,3-Butadiene	0.020	0.020	0.020	0.044	0.044	0.044		1
1,3-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
1,4-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
Benzene	0.127	0.070	0.070	0.405	0.223	0.223		1
Bromodichloromethane	ND	0.020	0.010	ND	0.134	0.067		1
Bromoform	ND	0.020	0.020	ND	0.206	0.206		1
Carbon tetrachloride	0.094	0.020	0.020	0.591	0.126	0.126		1
Chlorobenzene	ND	0.020	0.020	ND	0.092	0.092		1
Chloroform	ND	0.020	0.020	ND	0.098	0.098		1
cis-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
Ethylbenzene	ND	0.020	0.020	ND	0.087	0.087		1
Methylene chloride	ND	0.500	0.500	ND	1.74	1.74		1
Methyl tert butyl ether	ND	0.020	0.020	ND	0.072	0.072		1
Naphthalene	ND	0.050	0.025	ND	0.262	0.131		1
XYLENE (TOTAL)	ND	0.060	0.060	ND	0.260	0.260		1
Tetrachloroethene	ND	0.020	0.020	ND	0.136	0.136		1
Toluene	0.164	0.050	0.050	0.618	0.188	0.188		1



Project Name: UNIFIRST WELLS G&H**Lab Number:** L1103364**Project Number:** MA000989.0002.0003**Report Date:** 03/30/11**SAMPLE RESULTS**

Lab ID: L1103364-02
 Client ID: AA-1
 Sample Location: WOBURN, MA

Date Collected: 03/11/11 16:50
 Date Received: 03/15/11
 Field Prep: Not Specified

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air by SIM - Mansfield Lab								
trans-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
trans-1,3-Dichloropropene	ND	0.020	0.020	ND	0.091	0.091		1
Trichloroethene	ND	0.020	0.020	ND	0.107	0.107		1
Vinyl chloride	ND	0.020	0.020	ND	0.051	0.051		1
Isopropylbenzene	ND	0.500	0.500	ND	2.46	2.46		1

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-difluorobenzene	82		60-140
bromochloromethane	97		60-140
chlorobenzene-d5	87		60-140



Project Name: UNIFIRST WELLS G&H**Lab Number:** L1103364**Project Number:** MA000989.0002.0003**Report Date:** 03/30/11**SAMPLE RESULTS**

Lab ID: L1103364-03
Client ID: SS-1
Sample Location: WOBURN, MA
Matrix: Soil_Vapor
Analytical Method: 48,TO-15-SIM
Analytical Date: 03/22/11 00:46
Analyst: BS

Date Collected: 03/11/11 18:21
Date Received: 03/15/11
Field Prep: Not Specified

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air by SIM - Mansfield Lab								
1,1,1-Trichloroethane	0.147	0.020	0.020	0.801	0.109	0.109		1
1,1,2-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,1-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
1,2,4-Trimethylbenzene	ND	0.020	0.020	ND	0.098	0.098		1
1,2-Dibromoethane	ND	0.020	0.010	ND	0.154	0.077		1
1,2-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,2-Dichloropropane	ND	0.020	0.020	ND	0.092	0.092		1
1,3-Butadiene	ND	0.020	0.020	ND	0.044	0.044		1
1,3-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
1,4-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
Benzene	ND	0.070	0.070	ND	0.223	0.223		1
Bromodichloromethane	ND	0.020	0.010	ND	0.134	0.067		1
Bromoform	ND	0.020	0.020	ND	0.206	0.206		1
Carbon tetrachloride	0.078	0.020	0.020	0.490	0.126	0.126		1
Chlorobenzene	ND	0.020	0.020	ND	0.092	0.092		1
Chloroform	ND	0.020	0.020	ND	0.098	0.098		1
cis-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
Ethylbenzene	ND	0.020	0.020	ND	0.087	0.087		1
Methylene chloride	ND	0.500	0.500	ND	1.74	1.74		1
Methyl tert butyl ether	ND	0.020	0.020	ND	0.072	0.072		1
Naphthalene	0.103	0.050	0.025	0.539	0.262	0.131		1
XYLENE (TOTAL)	0.063	0.060	0.060	0.273	0.260	0.260		1
Tetrachloroethene	50.6	0.020	0.020	343	0.136	0.136	E	1
Toluene	ND	0.050	0.050	ND	0.188	0.188		1



Project Name: UNIFIRST WELLS G&H**Lab Number:** L1103364**Project Number:** MA000989.0002.0003**Report Date:** 03/30/11**SAMPLE RESULTS**

Lab ID: L1103364-03
 Client ID: SS-1
 Sample Location: WOBURN, MA

Date Collected: 03/11/11 18:21
 Date Received: 03/15/11
 Field Prep: Not Specified

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air by SIM - Mansfield Lab								
trans-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
trans-1,3-Dichloropropene	ND	0.020	0.020	ND	0.091	0.091		1
Trichloroethene	ND	0.020	0.020	ND	0.107	0.107		1
Vinyl chloride	ND	0.020	0.020	ND	0.051	0.051		1
Isopropylbenzene	ND	0.500	0.500	ND	2.46	2.46		1

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-difluorobenzene	79		60-140
bromochloromethane	97		60-140
chlorobenzene-d5	88		60-140

Project Name: UNIFIRST WELLS G&H**Lab Number:** L1103364**Project Number:** MA000989.0002.0003**Report Date:** 03/30/11**SAMPLE RESULTS**

Lab ID: L1103364-03 D
 Client ID: SS-1
 Sample Location: WOBURN, MA
 Matrix: Soil_Vapor
 Analytical Method: 48,TO-15-SIM
 Analytical Date: 03/24/11 00:27
 Analyst: BS

Date Collected: 03/11/11 18:21
 Date Received: 03/15/11
 Field Prep: Not Specified

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air by SIM - Mansfield Lab								
Tetrachloroethene	46.9	0.040	0.040	318	0.271	0.271		2

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-difluorobenzene	82		60-140
bromochloromethane	99		60-140
chlorobenzene-d5	88		60-140

Project Name: UNIFIRST WELLS G&H**Lab Number:** L1103364**Project Number:** MA000989.0002.0003**Report Date:** 03/30/11**SAMPLE RESULTS**

Lab ID: L1103364-04
 Client ID: SS-2
 Sample Location: WOBURN, MA
 Matrix: Soil_Vapor
 Analytical Method: 48,TO-15-SIM
 Analytical Date: 03/21/11 23:30
 Analyst: BS

Date Collected: 03/11/11 19:00
 Date Received: 03/15/11
 Field Prep: Not Specified

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air by SIM - Mansfield Lab								
1,1,1-Trichloroethane	0.090	0.020	0.020	0.491	0.109	0.109		1
1,1,2-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,1-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
1,2,4-Trimethylbenzene	0.065	0.020	0.020	0.319	0.098	0.098		1
1,2-Dibromoethane	ND	0.020	0.010	ND	0.154	0.077		1
1,2-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,2-Dichloropropane	ND	0.020	0.020	ND	0.092	0.092		1
1,3-Butadiene	0.031	0.020	0.020	0.069	0.044	0.044		1
1,3-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
1,4-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
Benzene	0.419	0.070	0.070	1.34	0.223	0.223		1
Bromodichloromethane	ND	0.020	0.010	ND	0.134	0.067		1
Bromoform	ND	0.020	0.020	ND	0.206	0.206		1
Carbon tetrachloride	0.088	0.020	0.020	0.553	0.126	0.126		1
Chlorobenzene	ND	0.020	0.020	ND	0.092	0.092		1
Chloroform	0.066	0.020	0.020	0.322	0.098	0.098		1
cis-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
Ethylbenzene	0.131	0.020	0.020	0.568	0.087	0.087		1
Methylene chloride	ND	0.500	0.500	ND	1.74	1.74		1
Methyl tert butyl ether	ND	0.020	0.020	ND	0.072	0.072		1
Naphthalene	ND	0.050	0.025	ND	0.262	0.131		1
XYLENE (TOTAL)	0.418	0.060	0.060	1.81	0.260	0.260		1
Tetrachloroethene	26.3	0.020	0.020	178	0.136	0.136		1
Toluene	1.05	0.050	0.050	3.95	0.188	0.188		1



Project Name: UNIFIRST WELLS G&H**Lab Number:** L1103364**Project Number:** MA000989.0002.0003**Report Date:** 03/30/11**SAMPLE RESULTS**

Lab ID: L1103364-04
 Client ID: SS-2
 Sample Location: WOBURN, MA

Date Collected: 03/11/11 19:00
 Date Received: 03/15/11
 Field Prep: Not Specified

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air by SIM - Mansfield Lab								
trans-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
trans-1,3-Dichloropropene	ND	0.020	0.020	ND	0.091	0.091		1
Trichloroethene	ND	0.020	0.020	ND	0.107	0.107		1
Vinyl chloride	ND	0.020	0.020	ND	0.051	0.051		1
Isopropylbenzene	ND	0.500	0.500	ND	2.46	2.46		1

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-difluorobenzene	81		60-140
bromochloromethane	89		60-140
chlorobenzene-d5	88		60-140



Project Name: UNIFIRST WELLS G&H**Lab Number:** L1103364**Project Number:** MA000989.0002.0003**Report Date:** 03/30/11**SAMPLE RESULTS**

Lab ID: L1103364-05
 Client ID: IA-2
 Sample Location: WOBURN, MA
 Matrix: Air
 Analytical Method: 48,TO-15-SIM
 Analytical Date: 03/21/11 18:25
 Analyst: BS

Date Collected: 03/11/11 16:47
 Date Received: 03/15/11
 Field Prep: Not Specified

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air by SIM - Mansfield Lab								
1,1,1-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1,2-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,1-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
1,2,4-Trimethylbenzene	0.677	0.020	0.020	3.32	0.098	0.098		1
1,2-Dibromoethane	ND	0.020	0.010	ND	0.154	0.077		1
1,2-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,2-Dichloropropane	ND	0.020	0.020	ND	0.092	0.092		1
1,3-Butadiene	0.132	0.020	0.020	0.292	0.044	0.044		1
1,3-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
1,4-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
Benzene	1.66	0.070	0.070	5.31	0.223	0.223		1
Bromodichloromethane	ND	0.020	0.010	ND	0.134	0.067		1
Bromoform	ND	0.020	0.020	ND	0.206	0.206		1
Carbon tetrachloride	0.078	0.020	0.020	0.490	0.126	0.126		1
Chlorobenzene	ND	0.020	0.020	ND	0.092	0.092		1
Chloroform	0.071	0.020	0.020	0.346	0.098	0.098		1
cis-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
Ethylbenzene	0.554	0.020	0.020	2.40	0.087	0.087		1
Methylene chloride	0.719	0.500	0.500	2.50	1.74	1.74		1
Methyl tert butyl ether	ND	0.020	0.020	ND	0.072	0.072		1
Naphthalene	0.095	0.050	0.025	0.498	0.262	0.131		1
XYLENE (TOTAL)	3.08	0.060	0.060	13.4	0.260	0.260		1
Tetrachloroethene	0.089	0.020	0.020	0.603	0.136	0.136		1
Toluene	5.95	0.050	0.050	22.4	0.188	0.188		1



Project Name: UNIFIRST WELLS G&H**Lab Number:** L1103364**Project Number:** MA000989.0002.0003**Report Date:** 03/30/11**SAMPLE RESULTS**

Lab ID: L1103364-05
 Client ID: IA-2
 Sample Location: WOBURN, MA

Date Collected: 03/11/11 16:47
 Date Received: 03/15/11
 Field Prep: Not Specified

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air by SIM - Mansfield Lab								
trans-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
trans-1,3-Dichloropropene	ND	0.020	0.020	ND	0.091	0.091		1
Trichloroethene	ND	0.020	0.020	ND	0.107	0.107		1
Vinyl chloride	ND	0.020	0.020	ND	0.051	0.051		1
Isopropylbenzene	ND	0.500	0.500	ND	2.46	2.46		1

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-difluorobenzene	96		60-140
bromochloromethane	104		60-140
chlorobenzene-d5	103		60-140

Project Name: UNIFIRST WELLS G&H**Lab Number:** L1103364**Project Number:** MA000989.0002.0003**Report Date:** 03/30/11**SAMPLE RESULTS**

Lab ID: L1103364-13
Client ID: TRIP BLANK
Sample Location: WOBURN, MA
Matrix: Air
Analytical Method: 48,TO-15-SIM
Analytical Date: 03/23/11 19:58
Analyst: BS

Date Collected: 03/12/11 00:00
Date Received: 03/15/11
Field Prep: Not Specified

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air by SIM - Mansfield Lab								
1,1,1-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1,2-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,1-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
1,2,4-Trimethylbenzene	ND	0.020	0.020	ND	0.098	0.098		1
1,2-Dibromoethane	ND	0.020	0.010	ND	0.154	0.077		1
1,2-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,2-Dichloropropane	ND	0.020	0.020	ND	0.092	0.092		1
1,3-Butadiene	ND	0.020	0.020	ND	0.044	0.044		1
1,3-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
1,4-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
Benzene	ND	0.070	0.070	ND	0.223	0.223		1
Bromodichloromethane	ND	0.020	0.010	ND	0.134	0.067		1
Bromoform	ND	0.020	0.020	ND	0.206	0.206		1
Carbon tetrachloride	ND	0.020	0.020	ND	0.126	0.126		1
Chlorobenzene	ND	0.020	0.020	ND	0.092	0.092		1
Chloroform	ND	0.020	0.020	ND	0.098	0.098		1
cis-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
Ethylbenzene	ND	0.020	0.020	ND	0.087	0.087		1
Methylene chloride	ND	0.500	0.500	ND	1.74	1.74		1
Methyl tert butyl ether	ND	0.020	0.020	ND	0.072	0.072		1
Naphthalene	ND	0.050	0.025	ND	0.262	0.131		1
XYLENE (TOTAL)	ND	0.060	0.060	ND	0.260	0.260		1
Tetrachloroethene	ND	0.020	0.020	ND	0.136	0.136		1
Toluene	0.056	0.050	0.050	0.211	0.188	0.188		1



Project Name: UNIFIRST WELLS G&H**Lab Number:** L1103364**Project Number:** MA000989.0002.0003**Report Date:** 03/30/11**SAMPLE RESULTS**

Lab ID: L1103364-13
 Client ID: TRIP BLANK
 Sample Location: WOBURN, MA

Date Collected: 03/12/11 00:00
 Date Received: 03/15/11
 Field Prep: Not Specified

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air by SIM - Mansfield Lab								
trans-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
trans-1,3-Dichloropropene	ND	0.020	0.020	ND	0.091	0.091		1
Trichloroethene	ND	0.020	0.020	ND	0.107	0.107		1
Vinyl chloride	ND	0.020	0.020	ND	0.051	0.051		1
Isopropylbenzene	ND	0.500	0.500	ND	2.46	2.46		1

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-difluorobenzene	77		60-140
bromochloromethane	92		60-140
chlorobenzene-d5	80		60-140



Project Name: UNIFIRST WELLS G&H

Lab Number: L1103364

Project Number: MA000989.0002.0003

Report Date: 03/30/11

Method Blank Analysis Batch Quality Control

Analytical Method: 48,TO-15-SIM

Analytical Date: 03/21/11 14:46

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air by SIM - Mansfield Lab for sample(s): 01-05,07-12,15-18 Batch: WG459569-4								
1,1,1-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1,2-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,1-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
1,2,4-Trimethylbenzene	ND	0.020	0.020	ND	0.098	0.098		1
1,2-Dibromoethane	ND	0.020	0.010	ND	0.154	0.077		1
1,2-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,2-Dichloropropane	ND	0.020	0.020	ND	0.092	0.092		1
1,3-Butadiene	ND	0.020	0.020	ND	0.044	0.044		1
1,3-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
1,4-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
Benzene	ND	0.070	0.070	ND	0.223	0.223		1
Bromodichloromethane	ND	0.020	0.010	ND	0.134	0.067		1
Bromoform	ND	0.020	0.020	ND	0.206	0.206		1
Carbon tetrachloride	ND	0.020	0.020	ND	0.126	0.126		1
Chlorobenzene	ND	0.020	0.020	ND	0.092	0.092		1
Chloroform	ND	0.020	0.020	ND	0.098	0.098		1
cis-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
Ethylbenzene	ND	0.020	0.020	ND	0.087	0.087		1
Methylene chloride	ND	0.500	0.500	ND	1.74	1.74		1
Methyl tert butyl ether	ND	0.020	0.020	ND	0.072	0.072		1
Naphthalene	ND	0.050	0.025	ND	0.262	0.131		1
XYLENE (TOTAL)	ND	0.060	0.060	ND	0.260	0.260		1
Tetrachloroethene	ND	0.020	0.020	ND	0.136	0.136		1
Toluene	ND	0.050	0.050	ND	0.188	0.188		1



Project Name: UNIFIRST WELLS G&H**Lab Number:** L1103364**Project Number:** MA000989.0002.0003**Report Date:** 03/30/11

Method Blank Analysis Batch Quality Control

Analytical Method: 48,TO-15-SIM

Analytical Date: 03/21/11 14:46

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air by SIM - Mansfield Lab for sample(s): 01-05,07-12,15-18 Batch: WG459569-4								
trans-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
trans-1,3-Dichloropropene	ND	0.020	0.020	ND	0.091	0.091		1
Trichloroethene	ND	0.020	0.020	ND	0.107	0.107		1
Vinyl chloride	ND	0.020	0.020	ND	0.051	0.051		1
Isopropylbenzene	ND	0.500	0.500	ND	2.46	2.46		1

Project Name: UNIFIRST WELLS G&H

Lab Number: L1103364

Project Number: MA000989.0002.0003

Report Date: 03/30/11

Method Blank Analysis Batch Quality Control

Analytical Method: 48,TO-15-SIM

Analytical Date: 03/23/11 17:56

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air by SIM - Mansfield Lab for sample(s): 03,13,16 Batch: WG459569-9								
1,1,1-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1,2-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,1-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
1,2,4-Trimethylbenzene	ND	0.020	0.020	ND	0.098	0.098		1
1,2-Dibromoethane	ND	0.020	0.010	ND	0.154	0.077		1
1,2-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,2-Dichloropropane	ND	0.020	0.020	ND	0.092	0.092		1
1,3-Butadiene	ND	0.020	0.020	ND	0.044	0.044		1
1,3-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
1,4-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
Benzene	ND	0.070	0.070	ND	0.223	0.223		1
Bromodichloromethane	ND	0.020	0.010	ND	0.134	0.067		1
Bromoform	ND	0.020	0.020	ND	0.206	0.206		1
Carbon tetrachloride	ND	0.020	0.020	ND	0.126	0.126		1
Chlorobenzene	ND	0.020	0.020	ND	0.092	0.092		1
Chloroform	ND	0.020	0.020	ND	0.098	0.098		1
cis-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
Ethylbenzene	ND	0.020	0.020	ND	0.087	0.087		1
Methylene chloride	ND	0.500	0.500	ND	1.74	1.74		1
Methyl tert butyl ether	ND	0.020	0.020	ND	0.072	0.072		1
Naphthalene	ND	0.050	0.025	ND	0.262	0.131		1
XYLENE (TOTAL)	ND	0.060	0.060	ND	0.260	0.260		1
Tetrachloroethene	ND	0.020	0.020	ND	0.136	0.136		1
Toluene	ND	0.050	0.050	ND	0.188	0.188		1



Project Name: UNIFIRST WELLS G&H**Lab Number:** L1103364**Project Number:** MA000989.0002.0003**Report Date:** 03/30/11

Method Blank Analysis Batch Quality Control

Analytical Method: 48,TO-15-SIM

Analytical Date: 03/23/11 17:56

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air by SIM - Mansfield Lab for sample(s): 03,13,16 Batch: WG459569-9								
trans-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
trans-1,3-Dichloropropene	ND	0.020	0.020	ND	0.091	0.091		1
Trichloroethene	ND	0.020	0.020	ND	0.107	0.107		1
Vinyl chloride	ND	0.020	0.020	ND	0.051	0.051		1
Isopropylbenzene	ND	0.500	0.500	ND	2.46	2.46		1

Lab Control Sample Analysis Batch Quality Control

Project Name: UNIFIRST WELLS G&H
Project Number: MA000989.0002.0003

Lab Number: L1103364
Report Date: 03/30/11

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air by SIM - Mansfield Lab Associated sample(s): 01-05,07-12,15-18 Batch: WG459569-3								
1,1,1-Trichloroethane	102		-		70-130	-		25
1,1,2-Trichloroethane	108		-		70-130	-		25
1,1-Dichloroethane	106		-		70-130	-		25
1,1-Dichloroethene	101		-		70-130	-		25
1,2,4-Trimethylbenzene	111		-		70-130	-		25
1,2-Dibromoethane	101		-		70-130	-		25
1,2-Dichloroethane	99		-		70-130	-		25
1,2-Dichloropropane	101		-		70-130	-		25
1,3-Butadiene	101		-		70-130	-		25
1,3-Dichlorobenzene	113		-		70-130	-		25
1,4-Dichlorobenzene	109		-		70-130	-		25
Benzene	85		-		70-130	-		25
Bromodichloromethane	101		-		70-130	-		25
Bromoform	103		-		70-130	-		25
Carbon tetrachloride	105		-		70-130	-		25
Chlorobenzene	99		-		70-130	-		25
Chloroform	97		-		70-130	-		25
cis-1,2-Dichloroethene	96		-		70-130	-		25
Ethylbenzene	87		-		70-130	-		25
Methylene chloride	103		-		70-130	-		25
Methyl tert butyl ether	87		-		70-130	-		25

Lab Control Sample Analysis

Batch Quality Control

Project Name: UNIFIRST WELLS G&H
Project Number: MA000989.0002.0003

Lab Number: L1103364
Report Date: 03/30/11

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air by SIM - Mansfield Lab Associated sample(s): 01-05,07-12,15-18 Batch: WG459569-3								
Naphthalene	80		-		70-130	-		25
Tetrachloroethene	97		-		70-130	-		25
Toluene	82		-		70-130	-		25
trans-1,2-Dichloroethene	92		-		70-130	-		25
trans-1,3-Dichloropropene	76		-		70-130	-		25
Trichloroethene	94		-		70-130	-		25
Vinyl chloride	105		-		70-130	-		25
Isopropylbenzene	105		-		70-130	-		25

Volatile Organics in Air by SIM - Mansfield Lab Associated sample(s): 03,13,16 Batch: WG459569-8								
1,1,1-Trichloroethane	107		-		70-130	-		25
1,1,2-Trichloroethane	111		-		70-130	-		25
1,1-Dichloroethane	111		-		70-130	-		25
1,1-Dichloroethene	102		-		70-130	-		25
1,2,4-Trimethylbenzene	124		-		70-130	-		25
1,2-Dibromoethane	103		-		70-130	-		25
1,2-Dichloroethane	102		-		70-130	-		25
1,2-Dichloropropane	105		-		70-130	-		25
1,3-Butadiene	98		-		70-130	-		25

Lab Control Sample Analysis **Batch Quality Control**

Project Name: UNIFIRST WELLS G&H

Lab Number: L1103364

Project Number: MA000989.0002.0003

Report Date: 03/30/11

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air by SIM - Mansfield Lab Associated sample(s): 03,13,16 Batch: WG459569-8								
1,3-Dichlorobenzene	123		-		70-130	-		25
1,4-Dichlorobenzene	117		-		70-130	-		25
Benzene	88		-		70-130	-		25
Bromodichloromethane	103		-		70-130	-		25
Bromoform	109		-		70-130	-		25
Carbon tetrachloride	110		-		70-130	-		25
Chlorobenzene	106		-		70-130	-		25
Chloroform	102		-		70-130	-		25
cis-1,2-Dichloroethene	100		-		70-130	-		25
Ethylbenzene	92		-		70-130	-		25
Methylene chloride	106		-		70-130	-		25
Methyl tert butyl ether	92		-		70-130	-		25
Naphthalene	83		-		70-130	-		25
Tetrachloroethene	101		-		70-130	-		25
Toluene	88		-		70-130	-		25
trans-1,2-Dichloroethene	94		-		70-130	-		25
trans-1,3-Dichloropropene	76		-		70-130	-		25
Trichloroethene	95		-		70-130	-		25
Vinyl chloride	102		-		70-130	-		25
Isopropylbenzene	116		-		70-130	-		25

Lab Duplicate Analysis Batch Quality Control

Project Name: UNIFIRST WELLS G&H
Project Number: MA000989.0002.00C

Lab Number: L1103364
Report Date: 03/30/11

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Volatile Organics in Air by SIM - Mansfield Lab Associated sample(s): 01-05,07-13,15-18 QC Batch ID: WG459569-5 QC Sample: L1103364-04 Client ID: SS-2						
1,1,1-Trichloroethane	0.090	0.104	ppbV	14		25
1,1,2-Trichloroethane	ND	ND	ppbV	NC		25
1,1-Dichloroethane	ND	ND	ppbV	NC		25
1,1-Dichloroethene	ND	ND	ppbV	NC		25
1,2,4-Trimethylbenzene	0.065	0.075	ppbV	14		25
1,2-Dibromoethane	ND	ND	ppbV	NC		25
1,2-Dichloroethane	ND	ND	ppbV	NC		25
1,2-Dichloropropane	ND	ND	ppbV	NC		25
1,3-Butadiene	0.031	0.037	ppbV	18		25
1,3-Dichlorobenzene	ND	ND	ppbV	NC		25
1,4-Dichlorobenzene	ND	ND	ppbV	NC		25
Benzene	0.419	0.467	ppbV	11		25
Bromodichloromethane	ND	ND	ppbV	NC		25
Bromoform	ND	ND	ppbV	NC		25
Carbon tetrachloride	0.088	0.102	ppbV	15		25
Chlorobenzene	ND	ND	ppbV	NC		25
Chloroform	0.066	0.069	ppbV	4		25
cis-1,2-Dichloroethene	ND	ND	ppbV	NC		25
Ethylbenzene	0.131	0.140	ppbV	7		25

Project Name: UNIFIRST WELLS G&H
Project Number: MA000989.0002.000

Lab Duplicate Analysis
Batch Quality Control

Lab Number: L1103364
Report Date: 03/30/11

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
Volatile Organics in Air by SIM - Mansfield Lab Associated sample(s): 01-05,07-13,15-18 QC Batch ID: WG459569-5 QC Sample: L1103364-04 Client ID: SS-2					
Methylene chloride	ND	ND	ppbV	NC	25
Methyl tert butyl ether	ND	ND	ppbV	NC	25
Naphthalene	ND	0.032J	ppbV	NC	25
XYLENE (TOTAL)	0.418	0.441	ppbV	5	25
Tetrachloroethene	26.3	29.2	ppbV	10	25
Toluene	1.05	1.12	ppbV	6	25
trans-1,2-Dichloroethene	ND	ND	ppbV	NC	25
trans-1,3-Dichloropropene	ND	ND	ppbV	NC	25
Trichloroethene	ND	ND	ppbV	NC	25
Vinyl chloride	ND	ND	ppbV	NC	25
Isopropylbenzene	ND	ND	ppbV	NC	25

Project Name: UNIFIRST WELLS G&H
Project Number: MA000989.0002.0003

Serial_No: 03301108:37
Lab Number: L1103364
Report Date: 03/30/11

Canister and Flow Controller Information

Samplenum	Client ID	Media ID	Media Type	Cleaning Batch ID	Initial Pressure (in. Hg)	Pressure on Receipt (in. Hg)	Flow Out mL/min	Flow In mL/min	% RSD
L1103364-01	IA-1	0373	#16 AMB		-	-	3.3	3.1	6
L1103364-01	IA-1	943	6.0L Can	L1102539-09	-30.0	-4.2	-	-	-
L1103364-02	AA-1	0477	#16 AMB		-	-	3.2	3.4	6
L1103364-02	AA-1	939	6.0L Can	L1102539-17	-30.0	-3.6	-	-	-
L1103364-03	SS-1	0068	#90 SV		-	-	160	157	2
L1103364-03	SS-1	771	6.0L Can	L1102539-02	-29.9	-4.9	-	-	-
L1103364-04	SS-2	0006	#90 SV		-	-	160	164	2
L1103364-04	SS-2	1524	6.0L Can	L1102539-05	-30.0	-4.9	-	-	-
L1103364-05	IA-2	0214	#16 AMB		-	-	3.0	2.8	7
L1103364-05	IA-2	991	6.0L Can	L1102539-08	-30.0	-7.6	-	-	-
L1103364-06	DUP IA-3-10-2011	0320	#90 SV		-	-	3.3	6.0	58
L1103364-06	DUP IA-3-10-2011	1695	6.0L Can	L1102539-16	-30.0	0.6	-	-	-
L1103364-13	TRIP BLANK	0250	#90 SV		-	-	160	163	2
L1103364-13	TRIP BLANK	1576	6.0L Can	L1102539-06	-30.0	-29.3	-	-	-



Air Volatiles Can Certification

Project Name:**Lab Number:** L1102539**Project Number:** Not Specified**Report Date:** 03/30/11**Air Canister Certification Results**

Lab ID: L1102539-02
 Client ID: CAN 771 FC 068
 Sample Location:
 Matrix: Air
 Analytical Method: 48,TO-15-SIM
 Analytical Date: 03/01/11 16:16
 Analyst: RY

Date Collected: 02/25/11 00:00
 Date Received: 02/25/11
 Field Prep: Not Specified

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air by SIM - Mansfield Lab								
1,1,1-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1,2-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,1-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
1,2,4-Trimethylbenzene	ND	0.020	0.020	ND	0.098	0.098		1
1,2-Dibromoethane	ND	0.020	0.010	ND	0.154	0.077		1
1,2-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,2-Dichloropropane	ND	0.020	0.020	ND	0.092	0.092		1
1,3-Butadiene	ND	0.020	0.020	ND	0.044	0.044		1
1,3-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
1,4-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
Benzene	ND	0.070	0.070	ND	0.223	0.223		1
Bromodichloromethane	ND	0.020	0.010	ND	0.134	0.067		1
Bromoform	ND	0.020	0.020	ND	0.206	0.206		1
Carbon tetrachloride	ND	0.020	0.020	ND	0.126	0.126		1
Chlorobenzene	ND	0.020	0.020	ND	0.092	0.092		1
Chloroform	ND	0.020	0.020	ND	0.098	0.098		1
cis-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
Ethylbenzene	ND	0.020	0.020	ND	0.087	0.087		1
Methylene chloride	ND	0.500	0.500	ND	1.74	1.74		1
Methyl tert butyl ether	ND	0.020	0.020	ND	0.072	0.072		1
Naphthalene	ND	0.050	0.025	ND	0.262	0.131		1
p/m-Xylene	ND	0.040	0.040	ND	0.174	0.174		1
o-Xylene	ND	0.020	0.020	ND	0.087	0.087		1
XYLENE (TOTAL)	ND	0.060	0.060	ND	0.260	0.260		1



Project Name:**Lab Number:** L1102539**Project Number:** Not Specified**Report Date:** 03/30/11**Air Canister Certification Results**

Lab ID: L1102539-02
 Client ID: CAN 771 FC 068
 Sample Location:

Date Collected: 02/25/11 00:00
 Date Received: 02/25/11
 Field Prep: Not Specified

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air by SIM - Mansfield Lab								
Tetrachloroethene	ND	0.020	0.020	ND	0.136	0.136		1
Toluene	ND	0.050	0.050	ND	0.188	0.188		1
trans-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
trans-1,3-Dichloropropene	ND	0.020	0.020	ND	0.091	0.091		1
Trichloroethene	ND	0.020	0.020	ND	0.107	0.107		1
Vinyl chloride	ND	0.020	0.020	ND	0.051	0.051		1
Isopropylbenzene	ND	0.500	0.500	ND	2.46	2.46		1



Project Name:**Lab Number:** L1102539**Project Number:** Not Specified**Report Date:** 03/30/11**Air Canister Certification Results**

Lab ID: L1102539-02
 Client ID: CAN 771 FC 068
 Sample Location:

Date Collected: 02/25/11 00:00
 Date Received: 02/25/11
 Field Prep: Not Specified

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air by SIM - Mansfield Lab								

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-difluorobenzene	75		60-140
bromochloromethane	81		60-140
chlorobenzene-d5	77		60-140



Project Name:**Lab Number:** L1102539**Project Number:** Not Specified**Report Date:** 03/30/11**Air Canister Certification Results**

Lab ID: L1102539-05
 Client ID: CAN 1524 FC 006
 Sample Location:
 Matrix: Air
 Analytical Method: 48,TO-15-SIM
 Analytical Date: 03/01/11 18:09
 Analyst: RY

Date Collected: 02/25/11 00:00
 Date Received: 02/25/11
 Field Prep: Not Specified

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air by SIM - Mansfield Lab								
1,1,1-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1,2-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,1-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
1,2,4-Trimethylbenzene	ND	0.020	0.020	ND	0.098	0.098		1
1,2-Dibromoethane	ND	0.020	0.010	ND	0.154	0.077		1
1,2-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,2-Dichloropropane	ND	0.020	0.020	ND	0.092	0.092		1
1,3-Butadiene	ND	0.020	0.020	ND	0.044	0.044		1
1,3-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
1,4-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
Benzene	ND	0.070	0.070	ND	0.223	0.223		1
Bromodichloromethane	ND	0.020	0.010	ND	0.134	0.067		1
Bromoform	ND	0.020	0.020	ND	0.206	0.206		1
Carbon tetrachloride	ND	0.020	0.020	ND	0.126	0.126		1
Chlorobenzene	ND	0.020	0.020	ND	0.092	0.092		1
Chloroform	ND	0.020	0.020	ND	0.098	0.098		1
cis-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
Ethylbenzene	ND	0.020	0.020	ND	0.087	0.087		1
Methylene chloride	ND	0.500	0.500	ND	1.74	1.74		1
Methyl tert butyl ether	ND	0.020	0.020	ND	0.072	0.072		1
Naphthalene	ND	0.050	0.025	ND	0.262	0.131		1
p/m-Xylene	ND	0.040	0.040	ND	0.174	0.174		1
o-Xylene	ND	0.020	0.020	ND	0.087	0.087		1
XYLENE (TOTAL)	ND	0.060	0.060	ND	0.260	0.260		1



Project Name:**Lab Number:** L1102539**Project Number:** Not Specified**Report Date:** 03/30/11**Air Canister Certification Results**

Lab ID: L1102539-05
 Client ID: CAN 1524 FC 006
 Sample Location:

Date Collected: 02/25/11 00:00
 Date Received: 02/25/11
 Field Prep: Not Specified

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air by SIM - Mansfield Lab								
Tetrachloroethene	ND	0.020	0.020	ND	0.136	0.136		1
Toluene	ND	0.050	0.050	ND	0.188	0.188		1
trans-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
trans-1,3-Dichloropropene	ND	0.020	0.020	ND	0.091	0.091		1
Trichloroethene	ND	0.020	0.020	ND	0.107	0.107		1
Vinyl chloride	ND	0.020	0.020	ND	0.051	0.051		1
Isopropylbenzene	ND	0.500	0.500	ND	2.46	2.46		1



Project Name:**Lab Number:** L1102539**Project Number:** Not Specified**Report Date:** 03/30/11**Air Canister Certification Results**

Lab ID: L1102539-05
 Client ID: CAN 1524 FC 006
 Sample Location:

Date Collected: 02/25/11 00:00
 Date Received: 02/25/11
 Field Prep: Not Specified

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air by SIM - Mansfield Lab								

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-difluorobenzene	73		60-140
bromochloromethane	80		60-140
chlorobenzene-d5	74		60-140



Project Name:**Lab Number:** L1102539**Project Number:** Not Specified**Report Date:** 03/30/11**Air Canister Certification Results**

Lab ID: L1102539-06
 Client ID: CAN 1576 FC 250
 Sample Location:
 Matrix: Air
 Analytical Method: 48,TO-15-SIM
 Analytical Date: 03/01/11 18:47
 Analyst: RY

Date Collected: 02/25/11 00:00
 Date Received: 02/25/11
 Field Prep: Not Specified

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air by SIM - Mansfield Lab								
1,1,1-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1,2-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,1-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
1,2,4-Trimethylbenzene	ND	0.020	0.020	ND	0.098	0.098		1
1,2-Dibromoethane	ND	0.020	0.010	ND	0.154	0.077		1
1,2-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,2-Dichloropropane	ND	0.020	0.020	ND	0.092	0.092		1
1,3-Butadiene	ND	0.020	0.020	ND	0.044	0.044		1
1,3-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
1,4-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
Benzene	ND	0.070	0.070	ND	0.223	0.223		1
Bromodichloromethane	ND	0.020	0.010	ND	0.134	0.067		1
Bromoform	ND	0.020	0.020	ND	0.206	0.206		1
Carbon tetrachloride	ND	0.020	0.020	ND	0.126	0.126		1
Chlorobenzene	ND	0.020	0.020	ND	0.092	0.092		1
Chloroform	ND	0.020	0.020	ND	0.098	0.098		1
cis-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
Ethylbenzene	ND	0.020	0.020	ND	0.087	0.087		1
Methylene chloride	ND	0.500	0.500	ND	1.74	1.74		1
Methyl tert butyl ether	ND	0.020	0.020	ND	0.072	0.072		1
Naphthalene	ND	0.050	0.025	ND	0.262	0.131		1
p/m-Xylene	ND	0.040	0.040	ND	0.174	0.174		1
o-Xylene	ND	0.020	0.020	ND	0.087	0.087		1
XYLENE (TOTAL)	ND	0.060	0.060	ND	0.260	0.260		1



Project Name:**Lab Number:** L1102539**Project Number:** Not Specified**Report Date:** 03/30/11**Air Canister Certification Results**

Lab ID: L1102539-06
 Client ID: CAN 1576 FC 250
 Sample Location:

Date Collected: 02/25/11 00:00
 Date Received: 02/25/11
 Field Prep: Not Specified

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air by SIM - Mansfield Lab								
Tetrachloroethene	ND	0.020	0.020	ND	0.136	0.136		1
Toluene	ND	0.050	0.050	ND	0.188	0.188		1
trans-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
trans-1,3-Dichloropropene	ND	0.020	0.020	ND	0.091	0.091		1
Trichloroethene	ND	0.020	0.020	ND	0.107	0.107		1
Vinyl chloride	ND	0.020	0.020	ND	0.051	0.051		1
Isopropylbenzene	ND	0.500	0.500	ND	2.46	2.46		1



Project Name:**Lab Number:** L1102539**Project Number:** Not Specified**Report Date:** 03/30/11**Air Canister Certification Results**

Lab ID: L1102539-06
 Client ID: CAN 1576 FC 250
 Sample Location:

Date Collected: 02/25/11 00:00
 Date Received: 02/25/11
 Field Prep: Not Specified

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air by SIM - Mansfield Lab								

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-difluorobenzene	72		60-140
bromochloromethane	79		60-140
chlorobenzene-d5	74		60-140



Project Name:**Lab Number:** L1102539**Project Number:** Not Specified**Report Date:** 03/30/11**Air Canister Certification Results**

Lab ID: L1102539-08
 Client ID: CAN 991 FC 214
 Sample Location:
 Matrix: Air
 Analytical Method: 48,TO-15-SIM
 Analytical Date: 03/01/11 20:03
 Analyst: RY

Date Collected: 03/01/11 00:00
 Date Received: 03/01/11
 Field Prep: Not Specified

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air by SIM - Mansfield Lab								
1,1,1-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1,2-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,1-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
1,2,4-Trimethylbenzene	ND	0.020	0.020	ND	0.098	0.098		1
1,2-Dibromoethane	ND	0.020	0.010	ND	0.154	0.077		1
1,2-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,2-Dichloropropane	ND	0.020	0.020	ND	0.092	0.092		1
1,3-Butadiene	ND	0.020	0.020	ND	0.044	0.044		1
1,3-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
1,4-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
Benzene	ND	0.070	0.070	ND	0.223	0.223		1
Bromodichloromethane	ND	0.020	0.010	ND	0.134	0.067		1
Bromoform	ND	0.020	0.020	ND	0.206	0.206		1
Carbon tetrachloride	ND	0.020	0.020	ND	0.126	0.126		1
Chlorobenzene	ND	0.020	0.020	ND	0.092	0.092		1
Chloroform	ND	0.020	0.020	ND	0.098	0.098		1
cis-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
Ethylbenzene	ND	0.020	0.020	ND	0.087	0.087		1
Methylene chloride	ND	0.500	0.500	ND	1.74	1.74		1
Methyl tert butyl ether	ND	0.020	0.020	ND	0.072	0.072		1
Naphthalene	ND	0.050	0.025	ND	0.262	0.131		1
p/m-Xylene	ND	0.040	0.040	ND	0.174	0.174		1
o-Xylene	ND	0.020	0.020	ND	0.087	0.087		1
XYLENE (TOTAL)	ND	0.060	0.060	ND	0.260	0.260		1



Project Name:**Lab Number:** L1102539**Project Number:** Not Specified**Report Date:** 03/30/11**Air Canister Certification Results**

Lab ID: L1102539-08
 Client ID: CAN 991 FC 214
 Sample Location:

Date Collected: 03/01/11 00:00
 Date Received: 03/01/11
 Field Prep: Not Specified

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air by SIM - Mansfield Lab								
Tetrachloroethene	ND	0.020	0.020	ND	0.136	0.136		1
Toluene	ND	0.050	0.050	ND	0.188	0.188		1
trans-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
trans-1,3-Dichloropropene	ND	0.020	0.020	ND	0.091	0.091		1
Trichloroethene	ND	0.020	0.020	ND	0.107	0.107		1
Vinyl chloride	ND	0.020	0.020	ND	0.051	0.051		1
Isopropylbenzene	ND	0.500	0.500	ND	2.46	2.46		1



Project Name:**Lab Number:** L1102539**Project Number:** Not Specified**Report Date:** 03/30/11**Air Canister Certification Results**

Lab ID: L1102539-08
 Client ID: CAN 991 FC 214
 Sample Location:

Date Collected: 03/01/11 00:00
 Date Received: 03/01/11
 Field Prep: Not Specified

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air by SIM - Mansfield Lab								

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-difluorobenzene	74		60-140
bromochloromethane	81		60-140
chlorobenzene-d5	78		60-140



Project Name:**Lab Number:** L1102539**Project Number:** Not Specified**Report Date:** 03/30/11**Air Canister Certification Results**

Lab ID: L1102539-09
 Client ID: CAN 943 FC 373
 Sample Location:
 Matrix: Air
 Analytical Method: 48,TO-15-SIM
 Analytical Date: 03/01/11 20:40
 Analyst: RY

Date Collected: 03/01/11 00:00
 Date Received: 03/01/11
 Field Prep: Not Specified

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air by SIM - Mansfield Lab								
1,1,1-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1,2-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,1-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
1,2,4-Trimethylbenzene	ND	0.020	0.020	ND	0.098	0.098		1
1,2-Dibromoethane	ND	0.020	0.010	ND	0.154	0.077		1
1,2-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,2-Dichloropropane	ND	0.020	0.020	ND	0.092	0.092		1
1,3-Butadiene	ND	0.020	0.020	ND	0.044	0.044		1
1,3-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
1,4-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
Benzene	ND	0.070	0.070	ND	0.223	0.223		1
Bromodichloromethane	ND	0.020	0.010	ND	0.134	0.067		1
Bromoform	ND	0.020	0.020	ND	0.206	0.206		1
Carbon tetrachloride	ND	0.020	0.020	ND	0.126	0.126		1
Chlorobenzene	ND	0.020	0.020	ND	0.092	0.092		1
Chloroform	ND	0.020	0.020	ND	0.098	0.098		1
cis-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
Ethylbenzene	ND	0.020	0.020	ND	0.087	0.087		1
Methylene chloride	ND	0.500	0.500	ND	1.74	1.74		1
Methyl tert butyl ether	ND	0.020	0.020	ND	0.072	0.072		1
Naphthalene	ND	0.050	0.025	ND	0.262	0.131		1
p/m-Xylene	ND	0.040	0.040	ND	0.174	0.174		1
o-Xylene	ND	0.020	0.020	ND	0.087	0.087		1
XYLENE (TOTAL)	ND	0.060	0.060	ND	0.260	0.260		1



Serial_No:03301108:37

Project Name:**Lab Number:** L1102539**Project Number:** Not Specified**Report Date:** 03/30/11**Air Canister Certification Results**

Lab ID: L1102539-09
 Client ID: CAN 943 FC 373
 Sample Location:

Date Collected: 03/01/11 00:00
 Date Received: 03/01/11
 Field Prep: Not Specified

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air by SIM - Mansfield Lab								
Tetrachloroethene	ND	0.020	0.020	ND	0.136	0.136		1
Toluene	ND	0.050	0.050	ND	0.188	0.188		1
trans-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
trans-1,3-Dichloropropene	ND	0.020	0.020	ND	0.091	0.091		1
Trichloroethene	ND	0.020	0.020	ND	0.107	0.107		1
Vinyl chloride	ND	0.020	0.020	ND	0.051	0.051		1
Isopropylbenzene	ND	0.500	0.500	ND	2.46	2.46		1



Project Name:**Lab Number:** L1102539**Project Number:** Not Specified**Report Date:** 03/30/11**Air Canister Certification Results**

Lab ID: L1102539-09
 Client ID: CAN 943 FC 373
 Sample Location:

Date Collected: 03/01/11 00:00
 Date Received: 03/01/11
 Field Prep: Not Specified

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air by SIM - Mansfield Lab								

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-difluorobenzene	75		60-140
bromochloromethane	81		60-140
chlorobenzene-d5	80		60-140

Project Name:**Lab Number:** L1102539**Project Number:** Not Specified**Report Date:** 03/30/11**Air Canister Certification Results**

Lab ID: L1102539-16
 Client ID: CAN 1695 FC 320
 Sample Location:
 Matrix: Air
 Analytical Method: 48,TO-15-SIM
 Analytical Date: 03/02/11 01:06
 Analyst: RY

Date Collected: 03/01/11 00:00
 Date Received: 03/01/11
 Field Prep: Not Specified

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air by SIM - Mansfield Lab								
1,1,1-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1,2-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,1-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
1,2,4-Trimethylbenzene	ND	0.020	0.020	ND	0.098	0.098		1
1,2-Dibromoethane	ND	0.020	0.010	ND	0.154	0.077		1
1,2-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,2-Dichloropropane	ND	0.020	0.020	ND	0.092	0.092		1
1,3-Butadiene	ND	0.020	0.020	ND	0.044	0.044		1
1,3-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
1,4-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
Benzene	ND	0.070	0.070	ND	0.223	0.223		1
Bromodichloromethane	ND	0.020	0.010	ND	0.134	0.067		1
Bromoform	ND	0.020	0.020	ND	0.206	0.206		1
Carbon tetrachloride	ND	0.020	0.020	ND	0.126	0.126		1
Chlorobenzene	ND	0.020	0.020	ND	0.092	0.092		1
Chloroform	ND	0.020	0.020	ND	0.098	0.098		1
cis-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
Ethylbenzene	ND	0.020	0.020	ND	0.087	0.087		1
Methylene chloride	ND	0.500	0.500	ND	1.74	1.74		1
Methyl tert butyl ether	ND	0.020	0.020	ND	0.072	0.072		1
Naphthalene	ND	0.050	0.025	ND	0.262	0.131		1
p/m-Xylene	ND	0.040	0.040	ND	0.174	0.174		1
o-Xylene	ND	0.020	0.020	ND	0.087	0.087		1
XYLENE (TOTAL)	ND	0.060	0.060	ND	0.260	0.260		1



Project Name:**Lab Number:** L1102539**Project Number:** Not Specified**Report Date:** 03/30/11**Air Canister Certification Results**

Lab ID: L1102539-16
 Client ID: CAN 1695 FC 320
 Sample Location:

Date Collected: 03/01/11 00:00
 Date Received: 03/01/11
 Field Prep: Not Specified

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air by SIM - Mansfield Lab								
Tetrachloroethene	ND	0.020	0.020	ND	0.136	0.136		1
Toluene	ND	0.050	0.050	ND	0.188	0.188		1
trans-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
trans-1,3-Dichloropropene	ND	0.020	0.020	ND	0.091	0.091		1
Trichloroethene	ND	0.020	0.020	ND	0.107	0.107		1
Vinyl chloride	ND	0.020	0.020	ND	0.051	0.051		1
Isopropylbenzene	ND	0.500	0.500	ND	2.46	2.46		1



Project Name:**Lab Number:** L1102539**Project Number:** Not Specified**Report Date:** 03/30/11**Air Canister Certification Results**

Lab ID: L1102539-16
 Client ID: CAN 1695 FC 320
 Sample Location:

Date Collected: 03/01/11 00:00
 Date Received: 03/01/11
 Field Prep: Not Specified

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air by SIM - Mansfield Lab								

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-difluorobenzene	83		60-140
bromochloromethane	89		60-140
chlorobenzene-d5	84		60-140



Project Name:**Lab Number:**

L1102539

Project Number: Not Specified**Report Date:**

03/30/11

Air Canister Certification Results

Lab ID: L1102539-17
 Client ID: CAN 939 FC 477
 Sample Location:
 Matrix: Air
 Analytical Method: 48,TO-15-SIM
 Analytical Date: 03/02/11 01:45
 Analyst: RY

Date Collected: 03/01/11 00:00
 Date Received: 03/01/11
 Field Prep: Not Specified

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air by SIM - Mansfield Lab								
1,1,1-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1,2-Trichloroethane	ND	0.020	0.020	ND	0.109	0.109		1
1,1-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,1-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
1,2,4-Trimethylbenzene	ND	0.020	0.020	ND	0.098	0.098		1
1,2-Dibromoethane	ND	0.020	0.010	ND	0.154	0.077		1
1,2-Dichloroethane	ND	0.020	0.020	ND	0.081	0.081		1
1,2-Dichloropropane	ND	0.020	0.020	ND	0.092	0.092		1
1,3-Butadiene	ND	0.020	0.020	ND	0.044	0.044		1
1,3-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
1,4-Dichlorobenzene	ND	0.020	0.020	ND	0.120	0.120		1
Benzene	ND	0.070	0.070	ND	0.223	0.223		1
Bromodichloromethane	ND	0.020	0.010	ND	0.134	0.067		1
Bromoform	ND	0.020	0.020	ND	0.206	0.206		1
Carbon tetrachloride	ND	0.020	0.020	ND	0.126	0.126		1
Chlorobenzene	ND	0.020	0.020	ND	0.092	0.092		1
Chloroform	ND	0.020	0.020	ND	0.098	0.098		1
cis-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
Ethylbenzene	ND	0.020	0.020	ND	0.087	0.087		1
Methylene chloride	ND	0.500	0.500	ND	1.74	1.74		1
Methyl tert butyl ether	ND	0.020	0.020	ND	0.072	0.072		1
Naphthalene	ND	0.050	0.025	ND	0.262	0.131		1
p/m-Xylene	ND	0.040	0.040	ND	0.174	0.174		1
o-Xylene	ND	0.020	0.020	ND	0.087	0.087		1
XYLENE (TOTAL)	ND	0.060	0.060	ND	0.260	0.260		1



Project Name:**Lab Number:** L1102539**Project Number:** Not Specified**Report Date:** 03/30/11**Air Canister Certification Results**

Lab ID: L1102539-17
 Client ID: CAN 939 FC 477
 Sample Location:

Date Collected: 03/01/11 00:00
 Date Received: 03/01/11
 Field Prep: Not Specified

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air by SIM - Mansfield Lab								
Tetrachloroethene	ND	0.020	0.020	ND	0.136	0.136		1
Toluene	ND	0.050	0.050	ND	0.188	0.188		1
trans-1,2-Dichloroethene	ND	0.020	0.020	ND	0.079	0.079		1
trans-1,3-Dichloropropene	ND	0.020	0.020	ND	0.091	0.091		1
Trichloroethene	ND	0.020	0.020	ND	0.107	0.107		1
Vinyl chloride	ND	0.020	0.020	ND	0.051	0.051		1
Isopropylbenzene	ND	0.500	0.500	ND	2.46	2.46		1



Project Name:**Lab Number:** L1102539**Project Number:** Not Specified**Report Date:** 03/30/11**Air Canister Certification Results**

Lab ID: L1102539-17
 Client ID: CAN 939 FC 477
 Sample Location:

Date Collected: 03/01/11 00:00
 Date Received: 03/01/11
 Field Prep: Not Specified

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air by SIM - Mansfield Lab								

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-difluorobenzene	81		60-140
bromochloromethane	85		60-140
chlorobenzene-d5	81		60-140



Project Name: UNIFIRST WELLS G&H

Lab Number: L1103364

Project Number: MA000989.0002.0003

Report Date: 03/30/11

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Reagent H2O Preserved Vials Frozen on: NA

Cooler Information Custody Seal

Cooler

N/A Present/Intact

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1103364-01A	Canister - 6 Liter	N/A	NA		Y	Present/Intact	TO15-SIM-UNI(30)
L1103364-02A	Canister - 6 Liter	N/A	NA		Y	Present/Intact	TO15-SIM-UNI(30)
L1103364-03A	Canister - 6 Liter	N/A	NA		Y	Present/Intact	TO15-SIM-UNI(30)
L1103364-04A	Canister - 6 Liter	N/A	NA		Y	Present/Intact	TO15-SIM-UNI(30)
L1103364-05A	Canister - 6 Liter	N/A	NA		Y	Present/Intact	TO15-SIM-UNI(30)
L1103364-06A	Canister - 6 Liter	N/A	NA		Y	Present/Intact	CLEAN-FEE()
L1103364-13A	Canister - 6 Liter	N/A	NA		Y	Present/Intact	TO15-SIM-UNI(30)

*Values in parentheses indicate holding time in days

Project Name: UNIFIRST WELLS G&H

Lab Number: L1103364

Project Number: MA000989.0002.0003

Report Date: 03/30/11

GLOSSARY

Acronyms

EPA	· Environmental Protection Agency.
LCS	· Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	· Laboratory Control Sample Duplicate: Refer to LCS.
MDL	· Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	· Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.
MSD	· Matrix Spike Sample Duplicate: Refer to MS.
NA	· Not Applicable.
NC	· Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NI	· Not Ignitable.
RL	· Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	· Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Data Qualifiers

A	· Spectra identified as "Aldol Condensation Product".
B	· The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than five times (5x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank.
D	· Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.
E	· Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.
G	· The concentration may be biased high due to matrix interferences (i.e., co-elution) with non-target compound(s). The result should be considered estimated.
H	· The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.
I	· The RPD between the results for the two columns exceeds the method-specified criteria; however, the lower value has been reported due to obvious interference.
P	· The RPD between the results for the two columns exceeds the method-specified criteria.
Q	· The quality control sample exceeds the associated acceptance criteria. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when

Report Format: DU Report with "J" Qualifiers



Project Name: UNIFIRST WELLS G&H

Lab Number: L1103364

Project Number: MA000989.0002.0003

Report Date: 03/30/11

Data Qualifiers

the sample concentrations are less than 5x the RL. (Metals only.)

R · Analytical results are from sample re-analysis.

RE · Analytical results are from sample re-extraction.

J · Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL). This represents an estimated concentration for Tentatively Identified Compounds (TICs).

ND · Not detected at the method detection limit (MDL) for the sample.

Report Format: DU Report with "J" Qualifiers



Project Name: UNIFIRST WELLS G&H

Lab Number: L1103364

Project Number: MA000989.0002.0003

Report Date: 03/30/11

REFERENCES

- 48 Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air. Second Edition. EPA/625/R-96/010b, January 1999.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.



Certificate/Approval Program Summary

Last revised March 23, 2011 – Mansfield Facility

The following list includes only those analytes/methods for which certification/approval is currently held.
For a complete listing of analytes for the referenced methods, please contact your Alpha Customer Service Representative.

Connecticut Department of Public Health Certificate/Lab ID: PH-0141.

Wastewater/Non-Potable Water (Inorganic Parameters: pH, Turbidity, Conductivity, Alkalinity, Aluminum, Antimony, Arsenic, Barium, Beryllium, Boron, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Potassium, Selenium, Silver, Sodium, Strontium, Thallium, Tin, Vanadium, Zinc, Total Residue (Solids), Total Suspended Solids (non-filterable), Total Cyanide. Organic Parameters: PCBs, Organochlorine Pesticides, Technical Chlordane, Toxaphene, Acid Extractables, Benzidines, Phthalate Esters, Nitrosamines, Nitroaromatics & Isophorone, PAHs, Haloethers, Chlorinated Hydrocarbons, Volatile Organics.)

Solid Waste/Soil (Inorganic Parameters: pH, Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Hexavalent Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, Zinc, Total Organic Carbon, Total Cyanide, Corrosivity, TCLP 1311. Organic Parameters: PCBs, Organochlorine Pesticides, Technical Chlordane, Toxaphene, Volatile Organics, Acid Extractables, Benzidines, Phthalates, Nitrosamines, Nitroaromatics & Cyclic Ketones, PAHs, Haloethers, Chlorinated Hydrocarbons.)

Florida Department of Health Certificate/Lab ID: E87814. *NELAP Accredited.*

Non-Potable Water (Inorganic Parameters: SM2320B, SM2540D, SM2540G.)

Solid & Chemical Materials (Inorganic Parameters: 6020, 7470, 7471, 9045. Organic Parameters: EPA 8260, 8270, 8082, 8081.)

Air & Emissions (EPA TO-15.)

Louisiana Department of Environmental Quality Certificate/Lab ID: 03090. *NELAP Accredited.*

Non-Potable Water (Inorganic Parameters: EPA 180.1, 245.7, 1631E, 3020, 6020A, 7470A, 9040, 9050A, SM2320B, 2540D, 2540G, 4500H-B, Organic Parameters: EPA 3510C, 3580A, 3630C, 3640A, 3660B, 3665A, 5030B, 8015D, 3570, 8081B, 8082A, 8260B, 8270C.)

Solid & Chemical Materials (Inorganic Parameters: EPA 1311, 3050, 3051A, 3060A, 6020A, 7196A, 7470A, 7471B, 7474, 9040B, 9045C, 9060. Organic Parameters: EPA 3540C, 3570B, 3580A, 3630C, 3640A, 3660, 3665A, 5035, 8015D, 8081B, 8082A, 8260B, 8270C.)

Biological Tissue (Inorganic Parameters: EPA 6020A. Organic Parameters: EPA 3570, 3510C, 3610B, 3630C, 3640A, 8270C.)

Air & Emissions (EPA TO-15.)

New Hampshire Department of Environmental Services Certificate/Lab ID: 2206. *NELAP Accredited.*

Non-Potable Water (Inorganic Parameters: EPA, 245.1, 245.7, 1631E, 180.1, 6020A, 7470A, 9040B, 9050A, SM2540D, 2540G, 4500H+B, 2320B. Organic Parameters: EPA 8081, 8082, 8260B, 8270C.)

Solid & Chemical Materials (Inorganic Parameters: SW-846 1311, 1312, 3050B, 3051A, 3060A, 6020A, 7470A, 7471A, 9040B, 9045C, 7196A. Organic Parameters: SW-846 3540C, 3580, 3630C, 3640A, 3660B, 3665A, 5035, 8260B, 8270C, 8015D, 8082, 8081A.)

New Jersey Department of Environmental Protection Certificate/Lab ID: MA015. *NELAP Accredited.*

Non-Potable Water (Inorganic Parameters: SW-846 1312, 3010, 3020A, 3015, SM2320B, EPA 200.8, SM2540D, 2540G, EPA 120.1, SM2510B, EPA 180.1, 245.1, 1631E, SW-846 7470A, 9040B, 6020, 9010B, 9014 Organic Parameters: SW-846 3510C, 3580A, 5030B, 5035L, 5035H, 3630C, 3640C, 3660B, 3665A, 8015B, 8081A, 8082, 8260B, 8270C)

Solid & Chemical Materials (Inorganic Parameters: SW-846 6020, 9010B, 9014, 1311, 1312, 3050B, 3051, 3060A, 7196A, 7470A, 7471A, 9040B, 9045C, 9060. Organic Parameters: SW-846 3540C, 3570, 3580A, 5030B, 5035L, 5035H, 3630C, 3640A, 3660B, 3665A, 8081A, 8082, 8260B, 8270C, 8015B.)

Atmospheric Organic Parameters (EPA TO-15)

Biological Tissue (Inorganic Parameters: SW-846 6020 Organic Parameters: SW-846 8270C, 3510C, 3570, 3630C, 3640A)

New York Department of Health Certificate/Lab ID: 11627. **NELAP Accredited.**

Non-Potable Water (Inorganic Parameters: SM2320B, SM2540D, EPA 200.8, 6020, 1631E, 245.1, 9014, 9040B, 120.1, SM2510B, 4500CN-E, 4500H-B, EPA 376.2, 180.1, 9010B. Organic Parameters: EPA 8260B, 8270C, 8081A, 8082, 3510C, 5030B.)

Solid & Hazardous Waste (Inorganic Parameters: EPA 6020, 7196A, 3060A, 7471A, 7474, 9014, 9040B, 9045C, 9010B. Organic Parameters: EPA 8260B, 8270C, 8081A, DRO 8015B, 8082, 1311, 1312, 3050B, 3580, 3570, 3051, 5035, 5030B.)

Air & Emissions (EPA TO-15.)

Rhode Island Department of Health Certificate/Lab ID: LAO00299. **NELAP Accredited via LA-DEQ.**

Refer to LA-DEQ Certificate for Non-Potable Water.

Texas Commission of Environmental Quality Certificate/Lab ID: T104704419-08-TX. **NELAP Accredited.**

Solid & Chemical Materials (Inorganic Parameters: EPA 6020, 7470, 7471, 1311, 7196, 9014, 9040, 9045, 9060. Organic Parameters: EPA 8015, 8270, 8260, 8081, 8082.)

Air (Organic Parameters: EPA TO-15)

Washington State Department of Ecology Certificate/Lab ID: C954. *Non-Potable Water* (Inorganic Parameters: SM2540D, 2510B, EPA 120.1, 180.1, 1631E, 245.7.)

Solid & Chemical Materials (Inorganic Parameters: EPA 9040, 9060, 6020, 7470, 7471, 7474. Organic Parameters: EPA 8081, 8082, 8015 Mod, 8270, 8260.)

U.S. Army Corps of Engineers

Department of Defense Certificate/Lab ID: L2217.01.

Non-Potable Water (Inorganic Parameters: EPA 6020A, SM4500H-B. Organic Parameters: 3020A, 3510C, 5030B, 8260B, 8270C, 8270C-ALK-PAH, 8082, 8081A, 8015D-SHC.)

Solid & Hazardous Waste (Inorganic Parameters: EPA 1311, 1312, 3050B, 6020A, 7471A, 9045C, 9060, SM 2540G, ASTM D422-63. Organic Parameters: EPA 3580A, 3570, 3540C, 5035A, 8260B, 8270C, 8270-ALK-PAH, 8082, 8081A, 8015D-SHC, 8015-DRO.

Air & Emissions (EPA TO-15.)

Analytes Not Accredited by NELAP

Certification is not available by NELAP for the following analytes: **8270C**: Biphenyl. **TO-15**: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 2-Methylnaphthalene, 1-Methylnaphthalene.



CHAIN OF CUSTODY

AIR ANALYSIS

PAGE 1 OF 2

320 Forbes Blvd, Mansfield, MA 02048
TEL: 508-822-9300 FAX: 508-822-3288

Client Information

Client: ARCADIS
Address: 402 Congress St Suite 501
Portland Maine 04101

Phone: 207-828-0046Fax: 207-828-0062Email: Mitch.Wadsworth@Arcadis-US.com☐ These samples have been previously analyzed by Alpha

Project Information

Project Name: Unit First Wells G & HProject Location: Woburn, MAProject #: MA000989-0002, 0003Project Manager: Nadine Weinberg

ALPHA Quote #:

Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved!)

Date Due:

Time:

Date Rec'd in Lab:

Report Information - Data Deliverables

☐ FAX☐ ADEX

Criteria Checker:

(Default based on Regulatory Criteria Indicated)

Other Formats:

☐ EMAIL (standard pdf report)☐ Additional Deliverables:

Report to: (if different than Project Manager)

ALPHA Job #:

L1103864

Billing Information

☐ Same as Client info PO #:

Regulatory Requirements/Report Limits

State/Fed	Program	Criteria

ANALYSIS

All Columns Below Must Be Filled Out

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection										TO-14A	TO-15	TO-15 APH	FIXED	TO-13A	TO-4/7	Sample Comments (i.e. PID)
		Date	Start Time	End Time	Initial Vacuum	Final Vacuum	Sample Matrix*	Sampler's Initials	Can Size	ID Can	ID - Flow Controller							
3364-01	IA-1	3/10/11	1748	3/11/11 1642	-29.6	-4.8	AA	MW	6L	943	373		X					
02	AA-1	3/10/11	1742	3/11/11 1650	-30	-5.0	AA	MW	6L	939	477		X					
03	SS-1	3/11/11	1751	1821	-28.9	-5.6	SV	MW	6L	771	068		X					
04	SS-2	3/11/11	1830	1900	-24.4	-5.7	SV	MW	6L	1524	006		X					
05	IA-2	3/10/11	1751	3/11/11 1647	-28.9	-8.2	AA	MW	6L	991	214		X					
06	DUP IA-3-10-2011	3/10/11	+	3/11/11 -	-30	-0.12	AA	MW	6L	1695	320		X				If zero Vacuum in lab, Do Not Analyze	

SAMPLE MATRIX CODES

AA = Ambient Air (Indoor/Outdoor)
SV = Soil Vapor/Landfill Gas/SVE
Other = Please Specify

Container Type

Relinquished By:

Date/Time

Received By:

Date/Time:



CHAIN OF CUSTODY

AIR ANALYSIS

PAGE 2 OF 2

320 Forbes Blvd, Mansfield, MA 02048
TEL: 508-822-9300 FAX: 508-822-3288

Client Information

Client: **ARCADIS**
Address: **482 Congress St Suite 501**
Portland, ME 04101
Phone: **207-828-0046**
Fax: **207-828-0062**
Email: **Mitch.Wadsworth@Arcadis-us.com**

☐ These samples have been previously analyzed by Alpha

Other Project Specific Requirements/Comments:

Project Information

Project Name: **On First Mills G & H**
Project Location: **Woburn, MA**
Project #: **MA000989.0002.0003**
Project Manager: **Nadine Weinberg**
ALPHA Quote #:

Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved)

Date Due:

Time:

Date Rec'd in Lab:

Report Information - Data Deliverables

☐ FAX
☐ ADEX

Criteria Checker: _____
(Default based on Regulatory Criteria Indicated)
Other Formats:

☐ EMAIL (standard pdf report)☐ Additional Deliverables:

Report to: (if different than Project Manager)

ALPHA Job #: **L1103364**

Billing Information

☐ Same as Client info PO #:

Regulatory Requirements/Report Limits

State/Fed	Program	Criteria

ANALYSIS

All Columns Below Must Be Filled Out

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection						Sample Matrix*	Sampler's Initials	Can Size	ID Can	ID - Flow Controller	TO-14A by TO-15	TO-15	TO-15 SIM	APH	FIXED GASES	TO-13A	TO-4/ TO-10	Sample Comments (i.e. PID)
		Date	Start Time	End Time	Initial	Final	Vacuum													

74	Trip Blank	3/12/11	-	-	-	-	-	AA	MW	6L	1665	061									Do Not Analyze, Would Not hold Vacuum when Capped
----	------------	---------	---	---	---	---	---	----	----	----	------	-----	--	--	--	--	--	--	--	--	---

*SAMPLE MATRIX CODES

AA = Ambient Air (Indoor/Outdoor)
SV = Soil Vapor/Landfill Gas/SVE
Other = Please Specify

Container Type

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

Relinquished By:

Date/Time

Received By:

Date/Time:



Appendix E

Preliminary Human Health Risk
Evaluation Report

UniFirst Corporation

Appendix E

Preliminary Human Health Risk Evaluation Report

**Residence, Parcel 26/ 05/ 04
Wells G&H Superfund Site
Woburn, Massachusetts**

April 2011



**Appendix E
Preliminary Human Health Risk
Evaluation Report**

Residence, Parcel 26/ 05/ 04
Wells G&H Superfund Site
Woburn, Massachusetts

Prepared for:
UniFirst

Prepared by:
ARCADIS U.S., Inc.
2 Executive Drive
Suite 303
Chelmsford
Massachusetts 01824
Tel 978 937 9999
Fax 978 937 7555

Our Ref.:
MA000989.0002

Date:
April 2011

This document is intended only for the use of the individual or entity for which it was prepared and may contain information that is privileged, confidential and exempt from disclosure under applicable law. Any dissemination, distribution or copying of this document is strictly prohibited.

1. Introduction	1
2. Comparison to Acute Exposure Criteria	1
3. Risk Evaluation	2
4. Results	4
4.1 Current Resident (Short-Term)	4
4.2 Current Resident (Long-Term)	4
5. Conclusions and Recommendations	4
6. References	5

Tables

Table 1	Acute and Occupational Exposure Criteria for COPCs Detected in Indoor Air
Table 2	Residential Indoor Air and Sub-slab Soil Vapor Data with Attenuation Factors
Table 3	Exposure Assumptions for the Estimation of Risks from Inhalation of Volatile Constituents in Indoor Air for a Resident
Table 4	Estimated Risks to a Resident from Short Term Exposure to Volatile Constituents in Indoor Air via Inhalation
Table 5	Estimated Risks to a Resident from Long Term Exposure to Volatile Constituents in Indoor Air via Inhalation

Attachment

A	Risk Tables
---	-------------

1. Introduction

ARCADIS U.S., Inc. (ARCADIS) has prepared a preliminary human health risk assessment based upon validated indoor air data presented in Table 1 of the Indoor Air Quality and Vapor Intrusion Assessment: Report of Results from samples collected on March 11-12, 2011 at the residence at Woburn Parcel Number 26/05/04 (the Residence). The list of compounds of potential concern (COPCs) is in accordance with Table 1 of the Indoor Air Quality and Vapor Intrusion Assessment Scope of Work (SOW) (The Johnson Company [JCO] 2010a) submitted to the U.S. Environmental Protection Agency (USEPA) by The Johnson Company on behalf of the UniFirst Corporation in March 2010 and Table 2 of Indoor Air Quality and Vapor Intrusion Assessment: Report of Results (IAQA/VI) (JCO 2010b). COPCs that were detected in any indoor air sample were considered in the risk assessment.

2. Comparison to Acute Exposure Criteria

In order to screen for potential near-term human health hazards, indoor air data were compared to two sets of acute exposure criteria, including Acute Minimal Risk Levels (MRLs) and Acute Exposure Guideline Levels (AEGLs). In addition, indoor air data were compared to occupational criteria, including Permissible Exposure Limits (PELs) and Threshold Limit Values (TLVs®) (Table 1). Acute inhalation MRLs are derived by the Agency for Toxic Substances and Disease Registry (ATSDR) for noncarcinogenic effects from exposures lasting 14 days or less. AEGLs are set by USEPA for infrequent or one-time exposures to airborne compounds. An eight-hour AEGL-1 represents a level above which it is expected that the general population could experience significant but reversible irritation or discomfort. PELs are federal standards enforceable by the Occupational Safety and Health Administration (OSHA) for an eight-hour time-weighted average occupational exposure. TLVs® are eight-hour time-weighted averages proposed by the American Conference of Governmental Industrial Hygienists (ACGIH) for occupational hazard assessment. If no acute exposure criteria or occupational criteria were available for a given compound, surrogate values were used where appropriate (Table 1). Comparisons were based on individual samples (i.e., assuming that an individual person would consistently remain at the sample location throughout the relevant exposure period).

No result exceeded acute exposure criteria. Thus, acute indoor air exposures to the COPCs would not pose significant risks of harm to human health.

3. Risk Evaluation

Indoor air and outdoor air samples were collected at the Residence on March 11 and 12, 2011. Subslab soil vapor samples were collected on March 12, 2011. The indoor air samples were collected at two locations in the basement of the Residence. Analytical results indicate that the majority of constituents detected in indoor air were present in both indoor air and sub-slab soil vapor samples. Calculated attenuation factors (AF) were equal to or above 1.0 for all constituents other than tetrachloroethene (PCE) (Table 2). These results indicate that indoor air concentrations exceed sub-slab soil vapor concentrations, and a background source is the primary source of the detected indoor air constituents. The AF of 0.98 for carbon tetrachloride indicates that this chemical was detected at nearly identical concentrations in indoor air and sub-slab soil vapor. The data also show that carbon tetrachloride was detected at a higher concentration in outdoor air collected upwind of the home, as compared to indoor air. These data suggest that the primary source of carbon tetrachloride in indoor air and shallow soil gas may be from outdoor air.

During pre-sampling activities, ARCADIS staff conducted a building survey to document building conditions and products that were found in the basement of the Residence. Since indoor air sampling was only conducted in the basement, the survey was not extended to the first floor or garage, where additional background sources of some chemicals may be located. The following potential background sources were identified during the survey:

- Field staff noted a car in the garage and a small fuel leak in the fuel oil line in the basement of the home. These are likely sources of concentrations of the petroleum constituents benzene, ethylbenzene, toluene, xylenes (BTEX), naphthalene, and 1,2,4-trimethylbenzene detected in indoor air.
- The home owner was seen smoking a cigarette in the basement of the home during indoor air sampling which may be a source of benzene, toluene, 1,3-butadiene, and naphthalene (<http://www.epa.gov/ttnatw01/hlthef/>).
- Bottles of bleach were noted in the basement during the site visit which may be sources of chloroform via reactions with other cleaning products (Odabasi 2008).

Risks from inhalation of volatile organic compounds in indoor air were estimated for a current resident for both long- and short-term exposures. Exposure assumptions were based on current USEPA guidance (USEPA 2009) (Table 3).

In accordance with USEPA guidance, long-term exposure was defined as 30 years for a current resident. The short-term exposure was performed for a five-year exposure in accordance with Massachusetts Department of Environmental Protection (MADEP) guidance for Imminent Hazard (IH) evaluations to determine if an IH condition existed as defined in the Massachusetts Contingency Plan (MCP) (MADEP 2008). As specified in the MCP, the IH evaluation was performed for current use receptors: current residents.

For each constituent, the exposure point concentration in indoor air is equal to the average concentration of the two indoor air results. Residents were assumed to be present 24 hours per day in the building. Exposure parameters for each scenario are presented in Table 3.

Risks were estimated according to USEPA guidance (USEPA 2009) and the MCP (MADEP 2008). Volatile organic compounds in indoor air were not considered to pose significant cumulative risk to human health within or below the USEPA Superfund target excess lifetime cancer risk range of 1×10^{-6} to 1×10^{-4} for potential carcinogenic effects and a target Hazard Index (HI) of 1 for potential noncarcinogenic effects. The criteria applicable to the MADEP IH evaluation are a target excess lifetime cancer risk of 1×10^{-5} for potential carcinogenic effects and a target Hazard Index (HI) of 1 for potential noncarcinogenic effects.

The risk assessment was executed on all constituents that were detected in at least one indoor air sample, including several constituents that have been demonstrated *not* to be site-related. 1,3-Butadiene, benzene, chloroform, ethylbenzene, and naphthalene were all detected at higher concentrations in indoor air than sub-slab soil vapor. Carbon tetrachloride was detected at a similar concentration in outdoor air compared to indoor air. 1,3-butadiene, benzene, and toluene were also detected in outdoor air, so ambient air may have contributed to background. Methylene chloride was not detected in sub-slab soil vapor or outdoor air, indicating a source inside the Residence. These constituents are present as a result of sources within the building and are not within the scope of a release to the environment addressed under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

4. Results

No indoor air sample exceeded acute exposure criteria or occupational criteria, and acute indoor air exposures to the COPCs are not estimated to pose significant risks to human health.

4.1 Current Resident (Short-Term)

As presented in Table 4, the cumulative estimated lifetime cancer risks for a short-term (5-year) exposure period to a current resident exposed to the COPCs detected in indoor air in the Residence did not exceed the MADEP IH target risk level of 1×10^{-5} (Table 4). Non-cancer hazards are equal to 1 for this exposure scenario. No IH condition as defined by the MCP was found to exist at the Residence for the short-term resident exposure scenario.

All risks to COPCs in indoor air were within the Superfund target excess lifetime cancer risk range of 1×10^{-6} to 1×10^{-4} and no individual chemical risks exceeded 3×10^{-6} (Table 4). It should be noted that the majority of risk (68%) was due to exposure to benzene and naphthalene which are likely to be present in indoor air from background sources. Risks associated with PCE only account for 3% of the total risk, or an estimated risk level of 2×10^{-7} .

4.2 Current Resident (Long-Term)

Cumulative estimated cancer risks for a long-term (30-year) exposure period to a current resident exposed to COPCs in indoor air were within the Superfund target excess lifetime cancer risk range of 1×10^{-6} to 1×10^{-4} (Table 5). All non-cancer hazards are equal to 1 for this exposure scenario (Table 5). Benzene and naphthalene continue to drive the estimated risk level, making up 68% of risk. The risk associated with exposure to PCE in indoor air is 1×10^{-6} for the long term current resident.

5. Conclusions and Recommendations

No indoor air sample exceeded acute exposure criteria or occupational criteria, and acute indoor air exposures to the COPCs are not estimated to pose significant risks to human health. Cumulative estimated carcinogenic and noncarcinogenic risks for current residents did not exceed target risk levels for a short-term (5-year) exposure period. No IH condition as defined by the MCP was found to exist at the Residence.

Long term estimated excess lifetime carcinogenic risks for current residents (30 years) are all within the Superfund target excess lifetime cancer risk range of 1×10^{-6} to 1×10^{-4} considering average indoor air concentrations and do not exceed 4×10^{-5} under any exposure scenario. All non-cancer HIs are below 1. All supporting risk assessment tables are provided in Attachment A.

PCE was detected at low levels (0.5 to $0.6 \mu\text{g}/\text{m}^3$) that are consistent with background sources in residences throughout the United States. USEPA's indoor air background database reported a 50th percentile value of $0.7 \mu\text{g}/\text{m}^3$, a 75th percentile value of $1.4 \mu\text{g}/\text{m}^3$ and a 90th percentile value of $3.8 \mu\text{g}/\text{m}^3$ for PCE (Dawson 2008). The potential carcinogenic risk level estimated for the low levels of PCE detected in the Residence is 1×10^{-6} , a level of risk equal to the most conservative end of USEPA's risk range for Superfund sites. The estimated total risk, including exposure to other compounds in the Residence originating from background sources, is 4×10^{-5} , primarily due to benzene and naphthalene. The PCE concentrations measured in the Residence also are below the MADEP Threshold Value (TV) for PCE ($1.4 \mu\text{g}/\text{m}^3$). According to MADEP, when compounds of concern are measured in indoor air at levels that are below TVs, it can reasonably be concluded that a complete vapor intrusion pathway does not exist.

In accordance with the approved Vapor Intrusion Assessment Work Plan, another round of sampling will be conducted under warm weather conditions for comparison to the first round of results. Prior to conducting the next round of sampling, ARCADIS recommends that additional steps be taken to document and, to the extent feasible, to eliminate identifiable background sources inside the Residence.

6. References

- Dawson, Helen. 2008. Background Indoor Air Concentrations of Volatile Organic Compounds in North American Residences. Literature Review & Implications for Vapor Intrusion Assessment. Vapor Intrusion Workshop – AEHS Spring 2008, San Diego, California.
- Massachusetts Department of Environmental Protection (MADEP). 2008. Massachusetts Contingency Plan, 310 CMR 40.0000. Bureau of Waste Site Cleanup. February.

Odabasi, M., 2008. Halogenated Volatile Organic Compounds from the Use of Chlorine-Bleach-Containing Household Products. Environ. Sci. Technol. 42:1445-1451.

The Johnson Company (JCO). 2010a. Indoor Air Quality and Vapor Intrusion Assessment Scope of Work, Revision 2, UniFirst Property, Wells G&H Superfund Property. March 25.

JCO. 2010b. Indoor Air Quality and Vapor Intrusion Assessment Report of Results, UniFirst Property, Wells G&H Superfund Property. June 18.

U.S. Environmental Protection Agency (USEPA). 2009. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment). Office of Superfund Remediation and Technology Innovation. EPA-540-R-070-002. January.

Table 1. Acute and Occupational Exposure Criteria for COPCs Detected in Indoor Air

Compound	ATSDR MRL	USEPA AEGL	OSHA PEL	ACGIH TLV
1,2,4-Trimethylbenzene	NA	2.21E+05	NA	1.23E+05
1,3-Butadiene	2.21E+02	1.48E+06	2.21E+03	4.42E+03
Benzene	2.87E+01	2.87E+04	3.19E+04	1.60E+03
Carbon tetrachloride	NA	1.20E+05	6.30E+04	3.15E+04
Chloroform	4.87E+02	1.41E+05	2.40E+05	4.87E+04
Ethylbenzene	4.34E+04	1.43E+05	4.35E+05	4.34E+05
Methylene chloride	2.09E+03	2.09E+05	8.69E+04	1.74E+05
Naphthalene	NA	NA	5.00E+04	5.24E+04
Tetrachloroethene	1.36E+03	2.38E+05	6.79E+05	1.70E+05
Toluene	3.76E+03	7.53E+05	7.53E+05	7.53E+04
Xylenes	8.67E+03	5.64E+05	4.35E+05	4.34E+05

Notes:

All levels in $\mu\text{g}/\text{m}^3$. Levels reported in parts per million (ppm) were first converted to mg/m^3 :

(level in ppm)*(molecular weight)/24.45.

COPC = compound of potential concern

NA = value not available

ATSDR MRL = Agency for Toxic Substances and Disease Registry Minimum Risk Level (acute inhalation exposure)

USEPA AEGL = US Environmental Protection Agency Acute Exposure Guideline Level (8-hour AEGL 1; AEGL 2 if AEGL 1 not reported).

OSHA PEL = Occupational Safety and Health Administration Permissible Exposure Limits (29 CFR 1910 Subpart Z)

ACGIH TLV = American Conference of Governmental Industrial Hygienists Threshold Limit

Value® (time-weighted average)

Table 2. Residential Indoor Air and Sub-slab Soil Vapor Data with Attenuation Factors

Sample Name: Date Collected:	Units	IA-1 3/11/2011	IA-2 3/11/2011	Average Detected Concentration Indoor Air	SS-1 3/11/2011	SS-2 3/11/2011	Average Detected Concentration Sub- Slab Soil Vapor	AA-1 3/11/2011	Average Attenuation Factor (a)
1,1,1-Trichloroethane	ug/m3	0.109 U	0.109 U	ND	0.801	0.491	0.65	0.109 U	NA
1,1,2-Trichloroethane	ug/m3	0.109 U	0.109 U	ND	0.109 U	0.109 U	ND	0.109 U	NA
1,1-Dichloroethane	ug/m3	0.0810 U	0.0810 U	ND	0.0810 U	0.0810 U	ND	0.0810 U	NA
1,1-Dichloroethene	ug/m3	0.0790 U	0.0790 U	ND	0.0790 U	0.0790 U	ND	0.0790 U	NA
1,2,4-Trimethylbenzene	ug/m3	3.88	3.32	3.6	0.0980 U	0.319	0.32	0.0980 U	11
1,2-Dibromoethane	ug/m3	0.154 U	0.154 U	ND	0.154 U	0.154 U	ND	0.154 U	NA
1,2-Dichloroethane	ug/m3	0.0810 U	0.0810 U	ND	0.0810 U	0.0810 U	ND	0.0810 U	NA
1,2-Dichloropropane	ug/m3	0.0920 U	0.0920 U	ND	0.0920 U	0.0920 U	ND	0.0920 U	NA
1,3-Butadiene	ug/m3	0.351	0.292	0.32	0.0440 U	0.069	0.07	0.044	4.7
1,3-Dichlorobenzene	ug/m3	0.120 U	0.120 U	ND	0.120 U	0.120 U	ND	0.120 U	NA
1,4-Dichlorobenzene	ug/m3	0.120 U	0.120 U	ND	0.120 U	0.120 U	ND	0.120 U	NA
Benzene	ug/m3	5.93	5.31	5.6	0.223 U	1.34	1.3	0.405	4.2
Bromodichloromethane	ug/m3	0.134 U	0.134 U	ND	0.134 U	0.134 U	ND	0.134 U	NA
Bromoform	ug/m3	0.206 U	0.206 U	ND	0.206 U	0.206 U	ND	0.206 U	NA
Carbon Tetrachloride	ug/m3	0.534	0.49	0.51	0.49	0.553	0.52	0.591	0.98
Chlorobenzene	ug/m3	0.0920 U	0.0920 U	ND	0.0920 U	0.0920 U	ND	0.0920 U	NA
Chloroform	ug/m3	0.507	0.346	0.43	0.0980 U	0.322	0.32	0.0980 U	1.3
cis-1,2-Dichloroethene	ug/m3	0.0790 U	0.0790 U	ND	0.0790 U	0.0790 U	ND	0.0790 U	NA
Ethylbenzene	ug/m3	2.5	2.4	2.5	0.0870 U	0.568	0.57	0.0870 U	4.3
Isopropylbenzene	ug/m3	2.46 U	2.46 U	ND	2.46 U	2.46 U	ND	2.46 U	NA
Methyl tert-butyl ether	ug/m3	0.0720 U	0.0720 U	ND	0.0720 U	0.0720 U	ND	0.0720 U	NA
Methylene Chloride	ug/m3	1.74 U	2.5	1.69	1.74 U	1.74 U	ND	1.74 U	NA
Naphthalene	ug/m3	0.89 J	0.498 J	0.69	0.539 J	0.262 UJ	0.335	0.262 UJ	2.1
Tetrachloroethene	ug/m3	0.542	0.603	0.57	318	178	248	0.136 U	0.0023
Toluene	ug/m3	24.8	22.4	24	0.188 U	3.95	4.0	0.618	6.0
trans-1,2-Dichloroethene	ug/m3	0.0790 U	0.0790 U	ND	0.0790 U	0.0790 U	ND	0.0790 U	NA
trans-1,3-Dichloropropene	ug/m3	0.0910 U	0.0910 U	ND	0.0910 U	0.0910 U	ND	0.0910 U	NA
Trichloroethene	ug/m3	0.107 U	0.107 U	ND	0.107 U	0.107 U	ND	0.107 U	NA
Vinyl Chloride	ug/m3	0.0510 U	0.0510 U	ND	0.0510 U	0.0510 U	ND	0.0510 U	NA
Xylenes (total)	ug/m3	14.4	13.4	14	0.273	1.81	1.0	0.260 U	13

Notes:

(a) Attenuation Factor calculated as the ratio of the average detected indoor air to average detected sub-slab soil vapor concentration

U - The compound was analyzed for but not detected. The associated value is the compound quantitation limit

ug/m3 - Micrograms per cubic meter

IA - Indoor air sample

AA - Ambient air sample

SS - Sub-slab soil vapor sample

NA - Not applicable

ND - Not detected

Table 3. Exposure Assumptions for the Estimation of Risks from Inhalation of Volatile Constituents in Indoor Air for a Resident

Parameter	Units	Current Future Resident – Short Term			Current Future Resident – Long Term		
		Value	Source	Comment	Value	Source	Comment
Exposure Time	hours/day	24	(a)		24	(a)	
Exposure Frequency	days/year	350	(a)		350	(a)	
Exposure Duration	years	5	(b)		30	(a)	
Averaging Time – Cancer	hours	613200	(a)		613200	(a)	
Averaging Time – Non-Cancer	hours	262800	(a)		262800	(a)	

Notes:

(a) USEPA 2009

(b) MADEP 2008

Table 4. Estimated Risks to a Resident from Short Term Exposure to Volatile Constituents in Indoor Air via Inhalation

Parameter	Definition	Units	Value
ET	Indoor Air Exposure Time	hours/day	24
EF	Indoor Air Exposure Frequency	days/yr	350
ED	Indoor Air Exposure Duration	years	5
ATc	Indoor Air Averaging Time - Cancer	hours	613200
ATn	Indoor Air Averaging Time - Non-Cancer	hours	43800
CF	Conversion Factor	ug/mg	1000

Compound	EPC (a) Indoor Air (mg/m3)	RfC (mg/m3)	URF 1/(ug/m3)	ADE-c mg/m3	ADE-nc mg/m3	Cancer Risk Indoor Air (unitless)	HI Indoor Air (unitless)	% of Total Cancer Risk (unitless)	% of Total Noncancer HI (unitless)
1,1,1-Trichloroethane	ND	5	NA	ND	ND	ND	ND	NA	NA
1,1,2-Trichloroethane	ND	NA	0.000016	ND	ND	ND	ND	NA	NA
1,1-Dichloroethane	ND	NA	0.0000016	ND	ND	ND	ND	NA	NA
1,1-Dichloroethene	ND	0.2	NA	ND	ND	ND	ND	NA	NA
1,2,4-Trimethylbenzene	3.60E-03	0.007	NA	NA	3.45E-03	NA	0.5	NA	41%
1,2-Dibromoethane	ND	0.009	0.0006	ND	ND	ND	ND	NA	NA
1,2-Dichloroethane	ND	2.4	0.000026	ND	ND	ND	ND	NA	NA
1,2-Dichloropropane	ND	0.004	0.00001	ND	ND	ND	ND	NA	NA
1,3-Butadiene	3.22E-04	0.002	0.00003	2.20E-05	3.08E-04	7E-07	0.2	10%	13%
1,3-Dichlorobenzene	ND	0.2	NA	ND	ND	ND	ND	NA	NA
1,4-Dichlorobenzene	ND	0.8	0.000011	ND	ND	ND	ND	NA	NA
Benzene	5.62E-03	0.03	0.0000078	3.85E-04	5.39E-03	3E-06	0.2	44%	15%
Bromodichloromethane	ND	NA	0.000037	ND	ND	ND	ND	NA	NA
Bromoform	ND	NA	0.0000011	ND	ND	ND	ND	NA	NA
Carbon tetrachloride	5.12E-04	0.1	0.000006	3.51E-05	4.91E-04	2E-07	0.005	3%	0%
Chlorobenzene	ND	0.05	NA	ND	ND	ND	ND	NA	NA
Chloroform	4.27E-04	0.098	0.000023	2.92E-05	4.09E-04	7E-07	0.004	10%	0%
cis-1,2-Dichloroethene	ND	0.035	NA	ND	ND	ND	ND	NA	NA
Ethylbenzene	2.45E-03	1	0.0000025	1.68E-04	2.35E-03	4E-07	0.002	6%	0%
Isopropylbenzene	ND	0.4	NA	ND	ND	ND	ND	NA	NA
Methylene chloride	1.69E-03	1	0.00000047	1.15E-04	1.62E-03	5E-08	0.002	1%	0%
Methyl tert butyl ether	ND	3	0.00000026	ND	ND	ND	ND	NA	NA
Naphthalene	6.94E-04	0.003	0.000034	4.75E-05	6.65E-04	2E-06	0.2	24%	18%
Tetrachloroethene	5.73E-04	0.27	0.0000059	3.92E-05	5.49E-04	2E-07	0.002	3%	0%
Toluene	2.36E-02	5	NA	NA	2.26E-02	NA	0.005	NA	0%
trans-1,2-Dichloroethene	ND	0.06	NA	ND	ND	ND	ND	NA	NA
trans-1,3-Dichloropropene	ND	0.02	0.000004	ND	ND	ND	ND	NA	NA
Trichloroethene	ND	NA	0.000002	ND	ND	ND	ND	NA	NA
Vinyl chloride	ND	0.1	0.0000044	ND	ND	ND	ND	NA	NA
Xylenes	1.39E-02	0.1	NA	NA	1.33E-02	NA	0.1	NA	11%
Total						7E-06	1	100%	100%

$$ADE = \frac{EPC_{air} \times ET \times EF \times ED}{AT}$$

$$HI_{inh} = \frac{ADE}{RfC}$$

$$Risk = ADE \times URF \times CF$$

Notes:

(a) EPC calculated as average of detected concentrations and one-half indoor air detection limit for non-detects.

EC = exposure concentration

EPC = exposure point concentration

RfC = reference concentration

URF = unit risk factor

ADE-c = average daily exposure (cancer)

ADE-nc = average daily exposure (noncancer)

HI = noncancer hazard index

ug/mg3 = microgram per cubic milligram

NA = Not available

ND = Not detected

mg/m3 = milligram per cubic meter

Table 5. Estimated Risks to a Resident from Long Term Exposure to Volatile Constituents in Indoor Air via Inhalation

Parameter	Definition	Units	Value
ET	Indoor Air Exposure Time	hours/day	24
EF	Indoor Air Exposure Frequency	days/yr	350
ED	Indoor Air Exposure Duration	years	30
ATc	Indoor Air Averaging Time - Cancer	hours	613200
ATn	Indoor Air Averaging Time - Non-Cancer	hours	262800
CF	Conversion Factor	ug/mg	1000

Compound	EPC (a) Indoor Air (mg/m3)	RfC (mg/m3)	URF 1/(ug/m3)	ADE-c mg/m3	ADE-nc mg/m3	Cancer Risk Indoor Air (unitless)	HI Indoor Air (unitless)	% of Total Cancer Risk (unitless)	% of Total Noncancer HI (unitless)
1,1,1-Trichloroethane	ND	5	NA	ND	ND	ND	ND	NA	NA
1,1,2-Trichloroethane	ND	NA	1.60E-05	ND	ND	ND	ND	NA	NA
1,1-Dichloroethane	ND	NA	1.60E-06	ND	ND	ND	ND	NA	NA
1,1-Dichloroethene	ND	0.2	NA	ND	ND	ND	ND	NA	NA
1,2,4-Trimethylbenzene	3.60E-03	0.007	NA	NA	3.5E-03	NA	0.5	NA	41%
1,2-Dibromoethane	ND	0.009	6.00E-04	ND	ND	ND	ND	NA	NA
1,2-Dichloroethane	ND	2.4	2.60E-05	ND	ND	ND	ND	NA	NA
1,2-Dichloropropane	ND	0.004	1.00E-05	ND	ND	ND	ND	NA	NA
1,3-Butadiene	3.22E-04	0.002	3.00E-05	1.3E-04	3.1E-04	4E-06	0.2	10%	13%
1,3-Dichlorobenzene	ND	0.2	NA	ND	ND	ND	ND	NA	NA
1,4-Dichlorobenzene	ND	0.8	1.10E-05	ND	ND	ND	ND	NA	NA
Benzene	5.62E-03	0.03	7.80E-06	2.3E-03	5.4E-03	2E-05	0.2	44%	15%
Bromodichloromethane	ND	NA	3.70E-05	ND	ND	ND	ND	NA	NA
Bromoform	ND	NA	1.10E-06	ND	ND	ND	ND	NA	NA
Carbon tetrachloride	5.12E-04	0.1	6.00E-06	2.1E-04	4.9E-04	1E-06	0.005	3%	0.4%
Chlorobenzene	ND	0.05	NA	ND	ND	ND	ND	NA	NA
Chloroform	4.27E-04	0.098	2.30E-05	1.8E-04	4.1E-04	4E-06	0.004	10%	0.3%
cis-1,2-Dichloroethene	ND	0.035	NA	ND	ND	ND	ND	NA	NA
Ethylbenzene	2.45E-03	1	2.50E-06	1.0E-03	2.3E-03	3E-06	0.002	6%	0.2%
Isopropylbenzene	ND	0.4	NA	ND	ND	ND	ND	NA	NA
Methyl tert butyl ether	ND	3	2.60E-07	ND	ND	ND	ND	NA	NA
Methylene chloride	1.69E-03	1	4.70E-07	6.9E-04	1.6E-03	3E-07	0.002	1%	0.1%
Naphthalene	6.94E-04	0.003	3.40E-05	2.9E-04	6.7E-04	1E-05	0.2	24%	18%
Tetrachloroethene	5.73E-04	0.27	5.90E-06	2.4E-04	5.5E-04	1E-06	0.002	3%	0.2%
Toluene	2.36E-02	5	NA	NA	2.3E-02	NA	0.005	NA	0.4%
trans-1,2-Dichloroethene	ND	0.06	NA	ND	ND	ND	ND	NA	NA
trans-1,3-Dichloropropene	ND	0.02	4.00E-06	ND	ND	ND	ND	NA	NA
Trichloroethene	ND	NA	2.00E-06	ND	ND	ND	ND	NA	NA
Vinyl chloride	ND	0.1	4.40E-06	ND	ND	ND	ND	NA	NA
Xylenes	1.39E-02	0.1	NA	NA	1.3E-02	NA	0.1	NA	11%
Total						4E-05	1	100%	100%

$$ADE = \frac{EPC_{air} \times ET \times EF \times ED}{AT}$$

$$HI_{inh} = \frac{ADE}{RfC}$$

$$Risk = ADE \times URF \times CF$$

Notes:

(a) EPC calculated as average of detected concentrations and one-half indoor air detection limit for non-detects.

EC = exposure concentration

EPC = exposure point concentration

RfC = reference concentration

URF = unit risk factor

ADE-c = average daily exposure (cancer)

ADE-nc = average daily exposure (noncancer)

HI = noncancer hazard index

ug/mg3 = microgram per cubic milligram

mg/m3 = milligram per cubic meter

NA = Not available

ND = Not detected

Appendix A

Risk Tables

Table
 Exposure and Risk Estimates Associated With Inhalation of Volatile Compounds in Air
 UniFirst Corporation
 Resident - Short Term
 Indoor Air
 Volatilization from Indoor Air
 Sample Location IA-01

Receptor:	Resident - Short Term	▼
Medium of Origin:	Indoor Air	▼
Exposure Medium:	Indoor Air	▼
Exposure Area:		▼
Depth:	NA	▼
Duration:		▼

$$C_{air} = \frac{C_{source}}{AF}$$

$$EC_{inh} = \frac{C_{air} \times ET \times EF \times ED}{AT}$$

$$HI_{inh} = \frac{EC_{inh}}{RfC}$$

$$Risk = EC_{inh} \times URF \times CF$$

Parameter	Definition	Units	Value	Comment
ET	Indoor Air Exposure Time	hours/day	24	
EF	Indoor Air Exposure Frequency	days/yr	350	
ED	Indoor Air Exposure Duration	years	5	
ATc	Indoor Air Averaging Time - Cancer	hours	613200	
ATn	Indoor Air Averaging Time - Non-Cancer	hours	43800	
CF	Conversion Factor	ug/mg	1000	

Compound	EPC							Risk	
	Indoor Air (mg/m3)	RfC (mg/m3)	URF 1/(ug/m3)	ADE-c mg/m3	Risk _{inh}	ADE-nc mg/m3	H _{linh}	(Indoor Air)	HI (Indoor Air)
1,1,1-Trichloroethane	ND	5	NA	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ND	NA	0.000016	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	NA	0.0000016	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	0.2	NA	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	3.88E-03	0.007	NA	NA	NA	3.72E-03	0.5	NA	0.5
1,2-Dibromoethane	ND	0.009	0.0006	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	ND	2.4	0.000026	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	ND	0.004	0.00001	ND	ND	ND	ND	ND	ND
1,3-Butadiene	3.51E-04	0.002	0.00003	2.40E-05	7E-07	3.37E-04	0.2	7E-07	0.2
1,3-Dichlorobenzene	ND	0.2	NA	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	ND	0.8	0.000011	ND	ND	ND	ND	ND	ND
Benzene	5.93E-03	0.03	0.0000078	4.06E-04	3E-06	5.69E-03	0.2	3E-06	0.2
Bromodichloromethane	ND	NA	0.000037	ND	ND	ND	ND	ND	ND
Bromoform	ND	NA	0.0000011	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	5.34E-04	0.1	0.000006	3.66E-05	2E-07	5.12E-04	0.005	2E-07	0.005
Chlorobenzene	ND	0.05	NA	ND	ND	ND	ND	ND	ND
Chloroform	5.07E-04	0.098	0.000023	3.47E-05	8E-07	4.86E-04	0.005	8E-07	0.005
cis-1,2-Dichloroethene	ND	0.035	NA	ND	ND	ND	ND	ND	ND
Ethylbenzene	2.50E-03	1	0.0000025	1.71E-04	4E-07	2.40E-03	0.002	4E-07	0.002
Isopropylbenzene	ND	0.4	NA	ND	ND	ND	ND	ND	ND
Methylene chloride	8.70E-04	1	0.00000047	5.96E-05	3E-08	8.34E-04	0.0008	3E-08	0.0008
Methyl tert butyl ether	ND	3	0.00000026	ND	ND	ND	ND	ND	ND
Naphthalene	8.90E-04	0.003	0.000034	6.10E-05	2E-06	8.53E-04	0.3	2E-06	0.3
Tetrachloroethene	5.42E-04	0.27	0.0000059	3.71E-05	2E-07	5.20E-04	0.002	2E-07	0.002
Toluene	2.48E-02	5	NA	NA	NA	2.38E-02	0.005	NA	0.005
trans-1,2-Dichloroethene	ND	0.06	NA	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	ND	0.02	0.000004	ND	ND	ND	ND	ND	ND
Trichloroethene	ND	NA	0.000002	ND	ND	ND	ND	ND	ND
Vinyl chloride	ND	0.1	0.0000044	ND	ND	ND	ND	ND	ND
Xylenes	1.44E-02	0.1	NA	NA	NA	1.38E-02	0.1	NA	0.1
Total					8E-06		1	8E-06	1

NA - Not available
 NC - Not calculated
 ND - Not detected

Table
 Exposure and Risk Estimates Associated With Inhalation of Volatile Compounds in Air
 UniFirst Corporation
 Resident - Long Term
 Indoor Air
 Volatilization from Indoor Air
 Sample Location IA-01

Receptor:	Resident - Long Term	▼
Medium of Origin:	Indoor Air	▼
Exposure Medium:	Indoor Air	▼
Exposure Area:		▼
Depth:	NA	▼
Duration:		▼

$$C_{air} = \frac{C_{source}}{AF}$$

$$EC_{inh} = \frac{C_{air} \times ET \times EF \times ED}{AT}$$

$$HI_{inh} = \frac{EC_{inh}}{RfC}$$

$$Risk = EC_{inh} \times URF \times CF$$

Parameter	Definition	Units	Value	Comment
ET	Indoor Air Exposure Time	hours/day	24	
EF	Indoor Air Exposure Frequency	days/yr	350	
ED	Indoor Air Exposure Duration	years	30	
ATc	Indoor Air Averaging Time - Cancer	hours	613200	
ATn	Indoor Air Averaging Time - Non-Cancer	hours	262800	
CF	Conversion Factor	ug/mg	1000	

Compound	EPC								Risk (Indoor Air)	HI (Indoor Air)
	Indoor Air (mg/m3)	RfC (mg/m3)	URF 1/(ug/m3)	ADE-c mg/m3	Risk _{inh}	ADE-nc mg/m3	H _{linh}			
1,1,1-Trichloroethane	ND	5	NA	ND	ND	ND	ND		ND	ND
1,1,2-Trichloroethane	ND	NA	0.000016	ND	ND	ND	ND		ND	ND
1,1-Dichloroethane	ND	NA	0.0000016	ND	ND	ND	ND		ND	ND
1,1-Dichloroethene	ND	0.2	NA	ND	ND	ND	ND		ND	ND
1,2,4-Trimethylbenzene	3.88E-03	0.007	NA	NA	NA	3.72E-03	0.5		NA	0.5
1,2-Dibromoethane	ND	0.009	0.0006	ND	ND	ND	ND		ND	ND
1,2-Dichloroethane	ND	2.4	0.000026	ND	ND	ND	ND		ND	ND
1,2-Dichloropropane	ND	0.004	0.00001	ND	ND	ND	ND		ND	ND
1,3-Butadiene	3.51E-04	0.002	0.00003	1.44E-04	4E-06	3.37E-04	0.2		4E-06	0.2
1,3-Dichlorobenzene	ND	0.2	NA	ND	ND	ND	ND		ND	ND
1,4-Dichlorobenzene	ND	0.8	0.000011	ND	ND	ND	ND		ND	ND
Benzene	5.93E-03	0.03	0.0000078	2.44E-03	2E-05	5.69E-03	0.2		2E-05	0.2
Bromodichloromethane	ND	NA	0.000037	ND	ND	ND	ND		ND	ND
Bromoform	ND	NA	0.0000011	ND	ND	ND	ND		ND	ND
Carbon tetrachloride	5.34E-04	0.1	0.000006	2.19E-04	1E-06	5.12E-04	0.005		1E-06	0.005
Chlorobenzene	ND	0.05	NA	ND	ND	ND	ND		ND	ND
Chloroform	5.07E-04	0.098	0.000023	2.08E-04	5E-06	4.86E-04	0.005		5E-06	0.005
cis-1,2-Dichloroethene	ND	0.035	NA	ND	ND	ND	ND		ND	ND
Ethylbenzene	2.50E-03	1	0.0000025	1.03E-03	3E-06	2.40E-03	0.002		3E-06	0.002
Isopropylbenzene	ND	0.4	NA	ND	ND	ND	ND		ND	ND
Methylene chloride	8.70E-04	1	0.00000047	3.58E-04	2E-07	8.34E-04	0.0008		2E-07	0.0008
Methyl tert butyl ether	ND	3	0.00000026	ND	ND	ND	ND		ND	ND
Naphthalene	8.90E-04	0.003	0.000034	3.66E-04	1E-05	8.53E-04	0.3		1E-05	0.3
Tetrachloroethene	5.42E-04	0.27	0.0000059	2.23E-04	1E-06	5.20E-04	0.002		1E-06	0.002
Toluene	2.48E-02	5	NA	NA	NA	2.38E-02	0.005		NA	0.005
trans-1,2-Dichloroethene	ND	0.06	NA	ND	ND	ND	ND		ND	ND
trans-1,3-Dichloropropene	ND	0.02	0.000004	ND	ND	ND	ND		ND	ND
Trichloroethene	ND	NA	0.000002	ND	ND	ND	ND		ND	ND
Vinyl chloride	ND	0.1	0.0000044	ND	ND	ND	ND		ND	ND
Xylenes	1.44E-02	0.1	NA	NA	NA	1.38E-02	0.1		NA	0.1
Total					5E-05		1		5E-05	1

NA - Not available
 NC - Not calculated
 ND - Not detected

Table
 Exposure and Risk Estimates Associated With Inhalation of Volatile Compounds in Air
 UniFirst Corporation
 Resident - Short Term
 Indoor Air
 Volatilization from Indoor Air
 Sample Location IA-02

Receptor:	Resident - Short Term	▼
Medium of Origin:	Indoor Air	▼
Exposure Medium:	Indoor Air	▼
Exposure Area:		▼
Depth:	NA	▼
Duration:		▼

$$C_{air} = \frac{C_{source}}{AF}$$

$$EC_{inh} = \frac{C_{air} \times ET \times EF \times ED}{AT}$$

$$HI_{inh} = \frac{EC_{inh}}{RfC}$$

$$Risk = EC_{inh} \times URF \times CF$$

Parameter	Definition	Units	Value	Comment
ET	Indoor Air Exposure Time	hours/day	24	
EF	Indoor Air Exposure Frequency	days/yr	350	
ED	Indoor Air Exposure Duration	years	5	
ATc	Indoor Air Averaging Time - Cancer	hours	613200	
ATn	Indoor Air Averaging Time - Non-Cancer	hours	43800	
CF	Conversion Factor	ug/mg	1000	

Compound	EPC							Risk	
	Indoor Air (mg/m3)	RfC (mg/m3)	URF 1/(ug/m3)	ADE-c mg/m3	Risk _{inh}	ADE-nc mg/m3	H _{inh}	(Indoor Air)	HI (Indoor Air)
1,1,1-Trichloroethane	ND	5	NA	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ND	NA	0.000016	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	NA	0.0000016	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	0.2	NA	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	3.32E-03	0.007	NA	NA	NA	3.18E-03	0.5	NA	0.5
1,2-Dibromoethane	ND	0.009	0.0006	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	ND	2.4	0.000026	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	ND	0.004	0.00001	ND	ND	ND	ND	ND	ND
1,3-Butadiene	2.92E-04	0.002	0.00003	2.00E-05	6E-07	2.80E-04	0.1	6E-07	0.1
1,3-Dichlorobenzene	ND	0.2	NA	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	ND	0.8	0.000011	ND	ND	ND	ND	ND	ND
Benzene	5.31E-03	0.03	0.0000078	3.64E-04	3E-06	5.09E-03	0.2	3E-06	0.2
Bromodichloromethane	ND	NA	0.000037	ND	ND	ND	ND	ND	ND
Bromoform	ND	NA	0.0000011	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	4.90E-04	0.1	0.000006	3.36E-05	2E-07	4.70E-04	0.005	2E-07	0.005
Chlorobenzene	ND	0.05	NA	ND	ND	ND	ND	ND	ND
Chloroform	3.46E-04	0.098	0.000023	2.37E-05	5E-07	3.32E-04	0.003	5E-07	0.003
cis-1,2-Dichloroethene	ND	0.035	NA	ND	ND	ND	ND	ND	ND
Ethylbenzene	2.40E-03	1	0.0000025	1.64E-04	4E-07	2.30E-03	0.002	4E-07	0.002
Isopropylbenzene	ND	0.4	NA	ND	ND	ND	ND	ND	ND
Methylene chloride	2.50E-03	1	0.00000047	1.71E-04	8E-08	2.40E-03	0.002	8E-08	0.002
Methyl tert butyl ether	ND	3	0.00000026	ND	ND	ND	ND	ND	ND
Naphthalene	4.98E-04	0.003	0.000034	3.41E-05	1E-06	4.78E-04	0.2	1E-06	0.2
Tetrachloroethene	6.03E-04	0.27	0.0000059	4.13E-05	2E-07	5.78E-04	0.002	2E-07	0.002
Toluene	2.24E-02	5	NA	NA	NA	2.15E-02	0.004	NA	0.004
trans-1,2-Dichloroethene	ND	0.06	NA	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	ND	0.02	0.000004	ND	ND	ND	ND	ND	ND
Trichloroethene	ND	NA	0.000002	ND	ND	ND	ND	ND	ND
Vinyl chloride	ND	0.1	0.0000044	ND	ND	ND	ND	ND	ND
Xylenes	1.34E-02	0.1	NA	NA	NA	1.28E-02	0.1	NA	0.1
Total					6E-06		1	6E-06	1

NA - Not available
 NC - Not calculated
 ND - Not detected

Table
 Exposure and Risk Estimates Associated With Inhalation of Volatile Compounds in Air
 UniFirst Corporation
 Resident - Long Term
 Indoor Air
 Volatilization from Indoor Air
 Sample Location IA-02

Receptor:	Resident - Long Term	▼
Medium of Origin:	Indoor Air	▼
Exposure Medium:	Indoor Air	▼
Exposure Area:		▼
Depth:	NA	▼
Duration:		▼

$$C_{air} = \frac{C_{source}}{AF}$$

$$EC_{inh} = \frac{C_{air} \times ET \times EF \times ED}{AT}$$

$$HI_{inh} = \frac{EC_{inh}}{RfC}$$

$$Risk = EC_{inh} \times URF \times CF$$

Parameter	Definition	Units	Value	Comment
ET	Indoor Air Exposure Time	hours/day	24	
EF	Indoor Air Exposure Frequency	days/yr	350	
ED	Indoor Air Exposure Duration	years	30	
ATc	Indoor Air Averaging Time - Cancer	hours	613200	
ATn	Indoor Air Averaging Time - Non-Cancer	hours	262800	
CF	Conversion Factor	ug/mg	1000	

Compound	EPC							Risk	
	Indoor Air (mg/m3)	RfC (mg/m3)	URF 1/(ug/m3)	ADE-c mg/m3	Risk _{inh}	ADE-nc mg/m3	H _{linh}	(Indoor Air)	HI (Indoor Air)
1,1,1-Trichloroethane	ND	5	NA	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ND	NA	0.000016	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	NA	0.0000016	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	0.2	NA	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	3.32E-03	0.007	NA	NA	NA	3.18E-03	0.5	NA	0.5
1,2-Dibromoethane	ND	0.009	0.0006	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	ND	2.4	0.000026	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	ND	0.004	0.00001	ND	ND	ND	ND	ND	ND
1,3-Butadiene	2.92E-04	0.002	0.00003	1.20E-04	4E-06	2.80E-04	0.1	4E-06	0.1
1,3-Dichlorobenzene	ND	0.2	NA	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	ND	0.8	0.000011	ND	ND	ND	ND	ND	ND
Benzene	5.31E-03	0.03	0.0000078	2.18E-03	2E-05	5.09E-03	0.2	2E-05	0.2
Bromodichloromethane	ND	NA	0.000037	ND	ND	ND	ND	ND	ND
Bromoform	ND	NA	0.0000011	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	4.90E-04	0.1	0.000006	2.01E-04	1E-06	4.70E-04	0.005	1E-06	0.005
Chlorobenzene	ND	0.05	NA	ND	ND	ND	ND	ND	ND
Chloroform	3.46E-04	0.098	0.000023	1.42E-04	3E-06	3.32E-04	0.003	3E-06	0.003
cis-1,2-Dichloroethene	ND	0.035	NA	ND	ND	ND	ND	ND	ND
Ethylbenzene	2.40E-03	1	0.0000025	9.86E-04	2E-06	2.30E-03	0.002	2E-06	0.002
Isopropylbenzene	ND	0.4	NA	ND	ND	ND	ND	ND	ND
Methylene chloride	2.50E-03	1	0.00000047	1.03E-03	5E-07	2.40E-03	0.002	5E-07	0.002
Methyl tert butyl ether	ND	3	0.00000026	ND	ND	ND	ND	ND	ND
Naphthalene	4.98E-04	0.003	0.000034	2.05E-04	7E-06	4.78E-04	0.2	7E-06	0.2
Tetrachloroethene	6.03E-04	0.27	0.0000059	2.48E-04	1E-06	5.78E-04	0.002	1E-06	0.002
Toluene	2.24E-02	5	NA	NA	NA	2.15E-02	0.004	NA	0.004
trans-1,2-Dichloroethene	ND	0.06	NA	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	ND	0.02	0.000004	ND	ND	ND	ND	ND	ND
Trichloroethene	ND	NA	0.000002	ND	ND	ND	ND	ND	ND
Vinyl chloride	ND	0.1	0.0000044	ND	ND	ND	ND	ND	ND
Xylenes	1.34E-02	0.1	NA	NA	NA	1.28E-02	0.1	NA	0.1
Total					4E-05		1	4E-05	1

NA - Not available
 NC - Not calculated
 ND - Not detected